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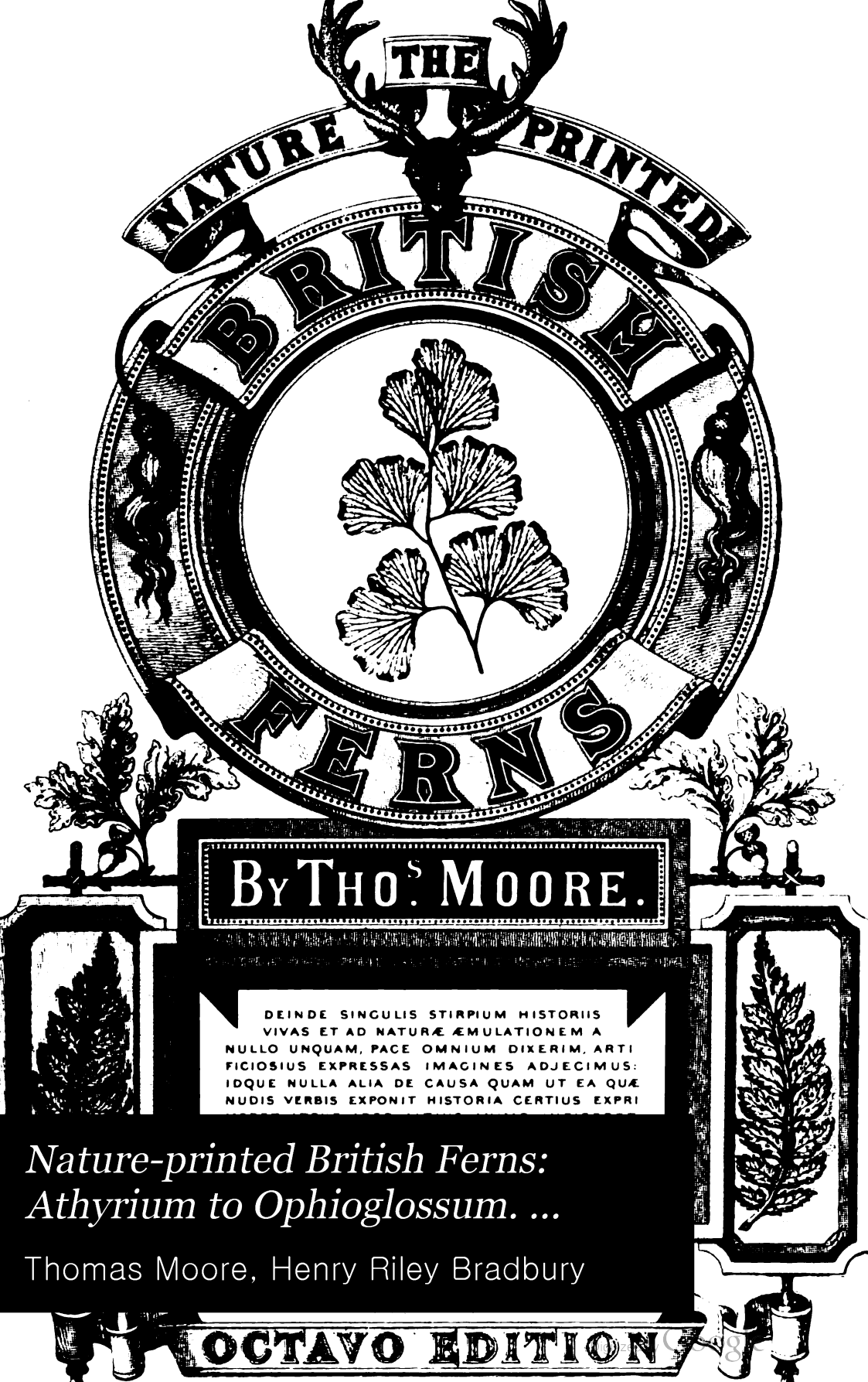

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GENUS VI.—XIX.

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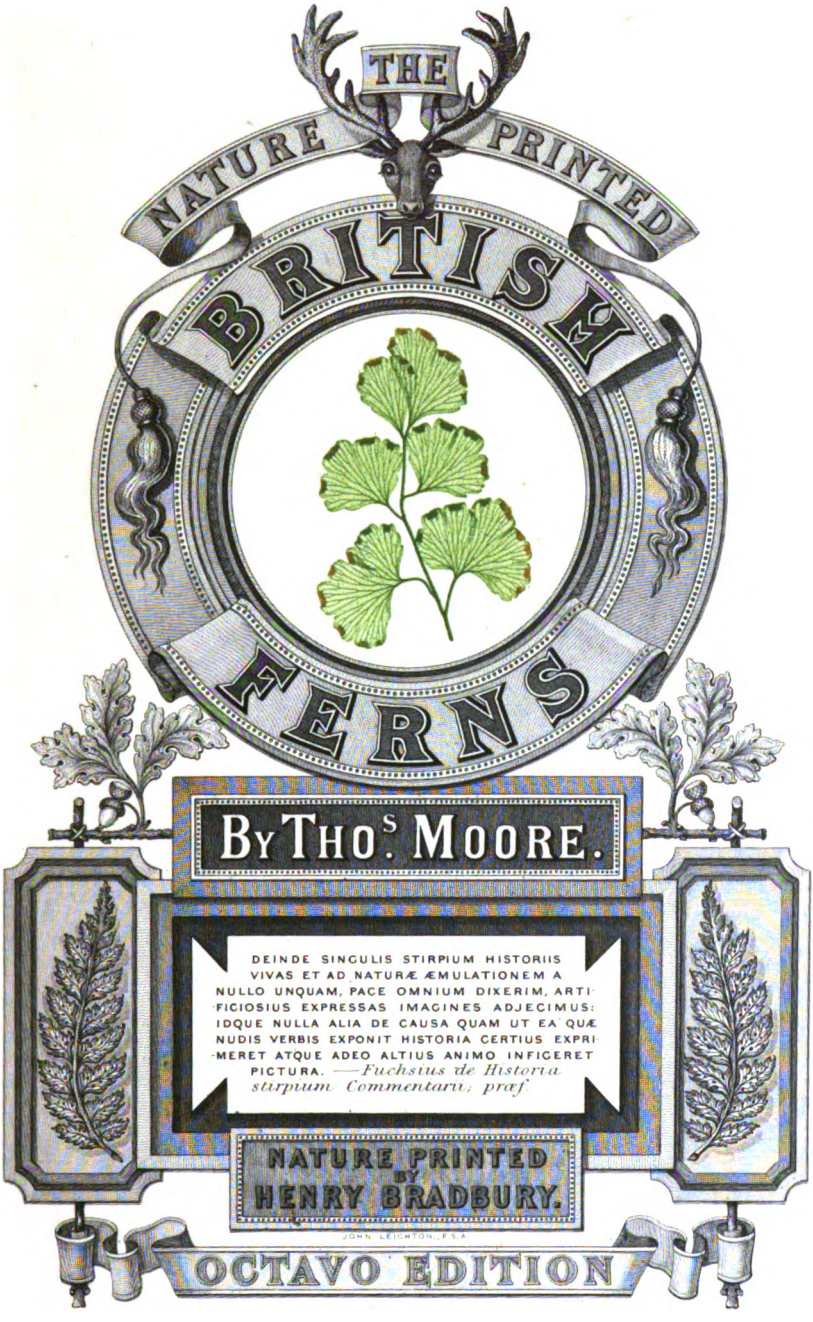
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NATURE-PRINTED

BRITISH FERNS:

BEING

FIGURES AND DESCRIPTIONS OF THE SPECIES AND VARIETIES OF FERNS FOUND IN THE UNITED KINGDOM.

BY

THOMAS MOORE, F.L.S., F.H.S.,

Author of "The Ferns of Great Britain and Ireland Nature-Printed;" "The Handbook of British Ferns;" "Index Filicum," &c.; Curator of the Chelsea Botanic Garden.

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VOL. II.—ATHYRIUM TO OPHIOGLOSSUM.

GENUS VI.—XIX.

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PREFACE TO VOL. II.

The interest attaching to the subject of British Ferns seems to be increasing, if we may judge from the varied communications with which we are favoured. Our present and concluding volume, though swelled beyond its assigned limit, and including a lengthened Addenda, fails to keep pace with the subject, several interesting forms, and various particulars respecting the distribution both of the species and their varieties, having reached us since the last pages have been printed. We may particularly mention a beautiful form of Lady Fern found in Cornwall, which we propose to name, after its discoverer, *Bulleriæ* *; and many particulars respecting the distribution of the Ferns in Ireland, communicated by Dr. Kinahan, and Mr. F. J. Foot. The additional information thus accumulating,

* Athyrium Filix-fœmina *v.* Bulleriæ (M.). This remarkably elegant crested variety of Lady Fern, is peculiar on account of the long narrow teeth of its small pinnules, and the obtuse dilated sharp-toothed tufts which terminate the fronds and the pinnæ. The fronds are about a foot long, and about two inches broad, tolerably symmetrical below, and divided at top into a corymbose tuft of branchlets about as broad as the frond itself. The pinnæ vary from seven-eighths of an inch to an inch and a quarter in length, averaging about an inch in the centre part of the frond, all the lower ones being deflexed; they are broadest at the base and narrow gradually towards the tassel, which is spread out and many branched, the divisions leafy at the sides and having obtuse dilated apices which, like the pinnules, are sharply and conspicuously toothed. The basal pinnules are oblong obtuse, sharply narrow-toothed as in *odontomanes;* the other pinnules smaller with a few sharp teeth. It may be regarded as an elegantly crested form of the *molle* type, having prominent acute teeth, and may rank near *multiceps* (ii., 52), which is also a Cornish form. The plant was found about two years since growing on a shaded bank in the neighbourhood of Tregullow, Cornwall, by Mrs. Hornby Buller, to whom it is dedicated.

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together with the results of further explorations, we hope to incorporate in a new edition, should the present issue meet with the generous approbation of the public.

We gladly avail ourselves of the opportunity now afforded, to renew our thanks to those numerous correspondents who have made us acquainted with the results of their researches among the British Ferns, and to whom the volumes now concluded owe much of their value.

CHELSEA, *May 29th*, 1860.

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THE BRITISH FERNS.

Genus VI: **ATHYRIUM**, *Roth.*

Gen. Char.—**Sori** indusiate, short oblong-lunate, hamate, or the basal ones more or less equally hippocrepiform; the **receptacles** occupying the anterior side, sometimes crossing and returning along the posterior side of the veins. **Indusium** of the same form, often lacerate-fimbriate at length reflexed by the crowded spore-cases. **Veins** simple or forked from a central costa; **venules** free, sometimes pinnate.

Fronds herbaceous bi-tri-pinnate, having the sori more or less generally (the basal ones usually, rarely nearly all) arcuate.

Caudex short, erect or creeping.

This genus holds as it were a middle place between the *Aspidieæ*, which have punctiform sori, and the *Asplenieæ*, in which they are linear. It belongs indeed to the latter group, the greater part of the sori being elongated, and a considerable proportion of them quite asplenioid; but others of them clearly indicate a passage from the straight elongate form typical of *Asplenium*, to the short reniform condition characteristic of *Lastrea*. The first indication of this change is seen in the curving of the upper ends of certain of the sori near the base of the pinnules, which curving produces what has been called a hamate or hooked form of sorus. This hooked condition of the sorus is farther changed in the anterior basal sori of most of the more divided forms of the common Lady Fern, to that of an equal-sided curve, resembling the figure of a horseshoe. Such equally-curved sori come very near indeed to those of *Lastrea*, and there can

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be little doubt that it was the examination of the plants in this state which led some botanists to refer the Lady Fern to the *Aspidieæ*, with which, the prevalence of linear sori, however, shows it to be widely at variance.

As originally constituted by Roth, the genus *Athyrium* appears to have been mainly founded on the short ovate sori, as distinguished from the more decidedly linear fructifications of *Asplenium*, and on the indusium being semilunate, fringed, lax, and at length repressed. Besides the forms of Lady Fern, Roth himself included only *Asplenium fontanum* and *Halleri*, two names for one species, which he probably referred to his new genus on account of its very short sori. Presl also, in characterising this genus, relied chiefly on the usually curved, rarely straight, short oblong sori, and on the presence of a convex or inflated indusium, and he includes in it the *Allantodiæ* of Brown, as also does Professor Fée. This latter appears to be the general view as to the limits of the group, whether adopted as a distinct genus or a section of *Asplenium*, the species of *Allantodia* with free veins, *Asplenium umbrosum* for example, being usually associated with the Lady Fern.

To us it appears that *Athyrium* proper, of which the Lady Fern is the type, is abundantly distinguished from *Asplenium;* but, with one exception, the characters above alluded to, are not those which we think should be relied on for its discrimination. In the shortness of the sori, there is nothing sufficiently fixed and definite to serve as a character distinguishing the group from *Asplenium* itself, in which the greatest variety as to the length of the sorus occurs; and accordingly we do not concur in the separation from *Asplenium*, of the free-veined species of *Allantodia* and their removal to *Athyrium*. The fringed margin of the indusium again, is altogether too trivial a character; nor is the vaulted or convex nature of the indusium a character of sufficient value or constancy to have so much importance assigned to it. It is in the semi-lunate or curved form of the sorus, to which various pteridologists have referred, that the most important characteristic of structure is indicated, though not very fully expressed. The constant production of these curved sori is, in our opinion, the great distinctive character of the genus *Athyrium*.

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The fructification of *Athyrium* will be found to consist of sori varying in form, and hence all parts of the frond should be thoroughly examined. Towards the extremities, that is to say, near the apices of the pinnules or segments, the sori will generally be found to consist of short lines, in which the characteristic curve is very little or not at all apparent. Such sori are undoubtedly asplenioid, and indicate the actual relationship of the genus. Next to these occur others which Professor Mettenius calls hamate, and which in their less developed condition answer to the semi-lunate sori which have been generally ascribed to *Athyrium*. These curved or hamate sori are formed by the receptacle, which constantly occupies the anterior side of the vein, crossing at the upper end and returning more or less on the opposite or posterior side. When the receptacle only just crosses the vein, the result is that the back of the sorus becomes concave, and the slightly curved or semi-lunate sorus is produced. When it returns on the posterior side, to about one-fourth or one-half the length of the sorus on the anterior side, the hamate or hook-like sorus is formed. In addition to these forms of sori, in all the more divided forms of the species others occur at the base of the segments which are hippocrepiform or horse-shoe-like in figure. These are produced by the receptacle becoming shortened and more completely returned, so that the portions on the anterior and posterior sides of the vein are nearly or quite equal. The occurrence of these hamate and hippocrepiform sori, more or less numerous, is abundantly distinctive, and absolutely separates *Athyrium* from *Asplenium*, by a manifest tendency towards the structure of the *Aspidieæ* as represented in *Lastrea*.

According to Mr. Newman,* the genus of the Lady Fern has always been a source of trouble and confusion to our botanists. "Lightfoot, Hudson, Withering, and Bolton," he remarks, "make it a *Polypodium;* Smith an *Aspidium;* Hooker an *Asplenium;* Babington an *Athyrium;* and all, as I conceive, with equal propriety. *Filix-femina* may readily be distinguished by its elongate and somewhat sausage-shaped clusters of capsules, covered by a similar-shaped involucre with its fringed free margin; the attachment of the clusters describes a concave, rather than a direct line as

* Newman, *Hist. Brit. Ferns*, 3 ed. 208.

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in *Asplenium*, and may be called crescentic. From *Hemestheum*, *Lastrea*, *Lophodium*, and *Dryopteris* [all forms of *Lastrea* as defined in this work], it differs in having the clusters of capsules linear rather than circular, attached to the side rather than to the back of the vein, and the involucre which covers them attached longitudinally rather than transversely. Whether it be distinct from *Pseudathyrium* is a graver and more difficult question. My own inclination is to unite them; but supposing this the philosophical solution of the question, how are we to manage the generic name? The species of *Pseudathyrium* are emphatically excluded from Roth's genus *Athyrium* by that learned author's definition of the involucre, and the species of *Athyrium* cannot be comprised in the genus *Pseudathyrium*, because that is distinguished by the absence of all involucre. Again, the two genera will not blend in one, because Roth's type species of *Athyrium* is *Asplenium fontanum*, and his second species *Asplenium Halleri*. Anticipating the time when characters founded on the absence, presence, size, or form of an involucre among *Filicaceæ* will be regarded as of no higher importance than those founded on the absence, presence, size, or form of a petal among *Ranunculaceæ*, I cannot but also anticipate the eventual union of plants so similar in habit as *Filix-femina* and *alpestre*, in a genus to which a new name may perhaps be given. The difficulty, in such an arrangement, lies in releasing the botanical mind from the cramping trammels which it has so long regarded as necessary. It is impossible for botanists to neglect the involucre; its characters are not only patent and manifest, but, what is a matter of still greater importance, are susceptible of perspicuous definition. Still, if the botanist seek to found on its variations higher groups than little clusters of species, which, like those known under the names of *ilvense*, *fragile*, *aculeatum*, *dilatatum*, *Filix-mas* or *Filix-femina*, may or may not be divided into species at the option or caprice of each successive author, he will find himself inextricably involved in the most tangled and unnatural combinations. With regard to the genus *Athyrium*, as composed by Roth of two groups, I am clearly of opinion that it cannot stand; the *fontanum* group and the *Filix-femina* group will not harmonise: then if we restrict the genus to the typical or *fontanum* group, we cannot, by Roth's definition,

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separate them from the normal *Aspleniums;* and we have no right whatever to restrict the genus to the *Filix-femina* or abnormal group, because that would be a palpable perversion of the author's meaning and intention."

We do not for ourselves discover confusion in the fact that successive authors have referred the Lady Fern to different genera, but regard the changes which from time to time have taken place, as the result of the progress which has steadily but surely been made in the knowledge of Ferns during the present century: the change in each case indicating a step in advance. We do not find authors of the present day referring the Lady Fern to *Polypodium;* and the fact of its having been so referred formerly is merely indicative of the general state of pteridology at the beginning of the present century. Roth's name was, indeed, proposed about the same date, but it did not come to be at all generally adopted, until the leaven of increasing knowledge had spread amongst the students of Ferns.

The genus *Athyrium*, though sometimes even now regarded by botanists as one of doubtful character, need not be so considered, on the grounds above referred to, namely, that Roth's typical species is *Asplenium fontanum*, and that we have no right to restrict the genus to the "*Filix-femina* or abnormal group;" for it is quite clear that the fact of *Asplenium fontanum* occurring first in Roth's enumeration of the species, is purely the accident of its being the smallest and the simplest of the forms he proposed to bring together, and does not constitute it the type of the genus, inasmuch as Roth, in his generic character, expressly states of the indusium, "margine laciniato-fimbriatum," which character belongs specially to the *Filix-fœmina* group, and does not at all apply to *A. fontanum*. There need be no hesitation, therefore, about restricting Roth's *Athyrium* within the limits to which he himself points, and thus identifying it with the Lady Fern. It is by taking a more comprehensive view, that the genus may be thought of doubtful value. Both Presl and Fée, as already intimated, unite *Allantodia* and *Athyrium*, under the latter name, and characterise the group mainly by the short oblong gibbous sori, and vaulted indusia, but these marks pass insensibly into those of *Asplenium*, and are insufficient to distinguish the group thus indicated: while the character afforded by the

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fringed indusia, on which Roth seems partly to have relied, is too trivial for the purpose of generic definition. The remaining character, that of the curved arcuate or horse-shoe-shaped sori, is entirely foreign to *Asplenium*, and indicates, as we have already stated, a tendency towards *Lastrea*. It is on this ground that we definitively adopt the genus, excluding, however, the straight-fruited free-veined *Allantodias* which should, in our opinion, be retained in *Asplenium*. The effect of this, though reducing *Athyrium* considerably, is not to restrict it entirely to the forms of *Filix-fœmina*, for a considerable number of distinct species, from various countries, have a similar fructification.

The species of *Athyrium* are analogous in habit with those forms of the *Polypodieæ* and *Aspidieæ*, in which the stem assumes the form of a short erect or decumbent caudex, which habit is represented among the British Ferns by the *Polypodium alpestre* and the *Lastrea Filix-mas*. There is, indeed, great similarity in habit between the Lady Fern, which is to be regarded as the type of *Athyrium* and the *Polypodium alpestre;* indeed the latter, as we have already pointed out (*ante*, vol. i. 78), has sometimes a certain amount of resemblance to *Athyrium* even in the fructification, which has led to its being constituted by Mr. Newman into a distinct genus, called *Pseudathyrium*.

The species of *Athyrium* have not hitherto been divided into sectional groups. They are found distributed over the whole of both hemispheres; and are generally of elegant aspect, our own native species fairly claiming precedence in this respect over all other British Ferns. Among the Indian species are some extremely beautiful plants, especially *Athyrium pectinatum* and *Athyrium Hookerianum*, both of which are remarkable for the finely toothed segments of their fronds, which in the former, inhabiting Nepal, Simla, etc., are lance-shaped in outline, and in the latter found by Dr. Hooker in Sikkim, are deltoid or broadly triangular.

The name of the genus was derived by Roth from the Greek *athyros*, opened, or having an open entrance alluding to the repressed indusium.

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BRITISH SPECIES AND VARIETIES.

A. Filix-fœmina: a perennial, with pinnate-pinnatifid, twice pinnate, or thrice pinnate lanceolate fronds; very prolific of varieties.

(*a*) *Fronds normal.*

(1) *Fronds broad lanceolate; pinnules flat.*

var. **marinum**: bipinnate; pinnules crowded, oblong-obtuse, connected by the wing of rachis; teeth mostly simple and even; sori short, much curved, near the costa.

var. **latifolium**: bipinnate; pinnules short-stalked, flat, imbricate, ovate; sori small, distant from the costa.

var. **acuminatum**: bipinnate; pinnæ with long acuminate apices; pinnules distinct decurrent linear-oblong; sori numerous, near the costa.

var. **incisum**: subtripinnate; pinnules linear-lanceolate, deeply pinnatifid, the lobes with marginal and apical teeth; sori numerous, near the costa.

var. **plumosum**: tripinnate; pinnules ovate-acuminate, imbricate, cut into linear inciso-pinnatifid secondary pinnules; segments narrow linear, unequally bifid or three-toothed; sori imperfect, submarginal in the sinuses.

var. **gracile**: bipinnate; pinnæ caudately acuminate; pinnules distant on the slender rachides, linear-oblong fringed with linear teeth; sori crowded, near the costa.

var. **dissectum**: bipinnate; pinnæ suddenly acuminate; pinnules distant decurrent, irregularly ovate-oblong, pinnatifid; lobes distant unequally toothed; sori near the costa at the base of the sinuses.

(2) *Fronds narrow lanceolate; pinnules convex.*

var. **rhæticum**: pinnules distinct, becoming linear by the incurvation of the apices of their lobes; sori numerous, near the costa.

(*b*) *Fronds monstrous, multifid.*

(1) *Fronds tall, symmetrical.*

var. **polydactylon**: pinnæ flat, bi-tri-furcate, with flat not crispy tassels.

var. **multifidum**: pinnules oblong acute, convex; tassels crispy, of numerous narrow slightly divergent segments.

var. **multiceps**: pinnules flat, oblong, unequal, inciso-serrate; tassels crispy, of numerous narrow lacerate spreading segments.

var. **corymbiferum**: pinnules broad, flat, oblong-obtuse; tassels of broad spreading tapered segments, their rachides bordered with normal pinnules.

(2) *Fronds dwarfish, unsymmetrical.*

var. **grandiceps**: terminal tassel broad, multifid-crisped, dense; pinnæ indistinctly tasselled.

var. **depauperatum**: terminal tassel loose, consisting of narrow lacerate segments; pinnæ lacerate tasselled.

(3) *Fronds dwarf, ramose.*

var. **acrocladon**: terminal tassels dense, multifid-crisped, with narrow projecting laciniately-toothed segments.

var. **crispum**: terminal tassels dense, multifid-crisped, obtuse.

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THE LADY FERN.

ATHYRIUM FILIX-FŒMINA.

A. fronds lanceolate, herbaceous, subbipinnate, or bi-tri-pinnate; pinnules oblong ovate or lanceolate, sessile and distinct, or more or less decurrent and united, toothed, or inciso-pinnatifid with the lobes toothed; the teeth acute, not spinulose.

— (type): fronds lanceolate, lax or drooping; pinnæ approximate or distinct; the lower pair smaller deflexed; pinnules flat, oblong connected by a winged rachis and toothed, or linear-lanceolate distinct and pinnatifid, the lobes more or less toothed. [Plate LII A.]

ATHYRIUM FILIX-FŒMINA, *Roth, Fl. Germ.* iii. 65. *Presl, Tent. Pterid.* 98, t. 3, fig. 5. *Fée, Gen. Fil.* 186. *Babington, Man. Brit. Bot.* 4 ed. 425 (β). *Sowerby, Ferns of Gt. Brit.* 43, t. 25. *Newman, Hist. Brit. Ferns,* 3 ed. 208. *Moore, Handb. Brit. Ferns,* 3 ed. 144; *Id., Ferns of Gt. Brit. Nature Printed,* tt. 30, 32.

ATHYRIUM FILIX-FŒMINA, *v.* MOLLE, *Newman, Hist. Brit. Ferns,* 2 ed. 242; 3 ed. 215. *Babington, Man. Brit. Bot.* 4 ed. 425 (γ). *Moore, Handb. Brit. Ferns,* 1 ed. 94; 2 ed. 139. *Sowerby, Ferns of Gt. Brit.* 44.

ATHYRIUM OVATUM, *Roth, Fl. Germ.* iii. 64 (Müll. Fl. Fridr. t. 2, f. 3)—not of Newman.

ATHYRIUM MOLLE, *Roth, Fl. Germ.* iii. 61. *Newman, Nat. Alm.* 1844, 26; *Id., Phytol.* 1851, *App.* xii.; *Id., Hist. Brit. Ferns,* 3 ed. 215 (excl. the Aberdeen habitat).

ATHYRIUM TRIFIDUM, *Roth, Fl. Germ.* iii. 63.

ATHYRIUM LAXUM, *Schumacher, Enum. Plant. Sælland.* ii. 16.

ATHYRIUM DEPAUPERATUM, *Schumacher, Enum. Plant. Sælland.* ii. 17.

ATHYRIUM LÆTUM, *Gray, Nat. Arr. Brit. Plants,* ii. 10.

ATHYRIUM ACROSTICHOIDEUM, *Bory: Merat, Fl. Par.* 4 ed. 373; according to Mettenius.

POLYPODIUM FILIX-FŒMINA, *Linnæus, Sp. Plant.* 1551. *Bolton, Filices Brit.* 46, t. 25 (bad). *Hoffmann, Deutschl. Fl.* ii. 6. *Poiret, Enc. Botanique,* v. 548. *Hudson, Fl. Ang.* 458.

POLYPODIUM FILIX-FŒMINA, α. CRENATA, *Weis, Pl. Crypt.* 313; according to Roth.

POLYPODIUM FILIX-FŒMINA, β. DENTATA, *Weis; Pl. Crypt.* 315.

POLYPODIUM DENTATUM, *Hoffmann, Deutschl. Fl.* ii. 7.

POLYPODIUM OBLONGO-DENTATUM, *Hoffmann, Rœm. and Ust. Mag. Bot.* 1790, pt. 9, 10, fig. 13 *a.*

POLYPODIUM OVATO-CRENATUM, *Hoffmann, Rœm. and Ust. Mag. Bot.* 1790, pt. 9, 10.

POLYPODIUM TRIFIDUM, *Hoffmann, Rœm. and Ust. Mag. Bot.* 1790, pt. 9, 10; *Id., Deutschl. Fl.* ii. 7.

POLYPODIUM BIFIDUM, *Hoffmann, Rœm. and Ust. Mag. Bot.* 1790, pt. 9, 10.

POLYPODIUM MOLLE, *Schreber, Spicileg. Fl. Lips.* 70. *Hoffmann, Deutschl. Fl.* ii. 7. *Poiret, Enc. Bot.* v. 536.

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POLYPODIUM LÆTUM, *Salisbury, Prod.* 403.
POLYPODIUM REVOLUTUM, *Bory;* according to Mettenius.
POLYPODIUM LESEBLII, *Merat, Fl. Par.* 2 ed. 276.
ASPLENIUM FILIX-FŒMINA, *Bernhardi, Schrad. neues Journ. Bot.* 1806, i. pt. 26, 27, 48, t. 2, fig. 7. *Sprengel, Syst. Veg.* iv. 88 (excl. syn. Poiret). *R. Brown, Prod. Fl. Nov. Holl.* 150. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 518. *Koch, Syn.* 2 ed. 981. *Hooker & Arnott, Brit. Fl.* 7 ed. 589. *Bentham, Handb. Brit. Fl.* 631. *Mackay, Fl. Hib.* 342. *Deakin, Florigr. Brit.* iv. 57, fig. 1589 (incl. vars. 1-4). *Gray, Bot. North. U. States,* 628. *Kunze, Lin.* xxiii. 234. *Mettenius, Fil. Hort. Bot. Lips.* 79, t. 13, fig. 15, 16; *Id., Asplen.* 199. *Lowe, Nat. Hist. Ferns,* v. t. 29. *Milde, Nov. Act. N. C.* xxvi. (ii.) 509.
ASPLENIUM FILIX-FŒMINA, *v.* MOLLE, *Deakin, Florigr. Brit.* iv. 59.
ASPLENIUM FILIX-FŒMINA, *v.* TRIFIDUM, *Deakin, Florigr. Brit.* iv. 59.
ASPLENIUM INTERMEDIUM, *Link, Enum. Alt.* ii. 459.
ASPIDIUM FILIX-FŒMINA, *Swartz, Schrad. Journ. Bot.* 1800, ii. 41; *Id., Syn. Fil.* 59. *Schkuhr, Krypt. Gew.* 56, t. 58, 59. *Weber and Mohr, Deutsch. Krypt. Gew.* 36. *Willdenow, Sp. Plant.* v. 276. *Smith, Fl. Brit.* 1124; *Id., Eng. Bot.* xxi. t. 1459 (not good); *Id., Eng. Fl.* 2 ed. iv. 282. *Tenore, Atti. Accad. dcl. R. Inst. Sc. Nat. Nap.* v. (reprint 13, t. 1, fig. 2). *Nyman, Syll. Fl. Europ.* 432.
NEPHRODIUM FILIX-FŒMINA, *Strempel, Fil. Berol. Syn.* 30.
TECTARIA FILIX-FŒMINA, *Cavanilles, Præl.* 1801, 251.
CYATHEA FILIX-FŒMINA, *Bertoloni, Amæn.* 429; according to Mettenius.
CYSTOPTERIS FILIX-FŒMINA, *Cosson and Germain, Fl. Par.* 676.

Var. **marinum:** fronds elliptic-lanceolate spreading; pinnæ approximate; pinnules crowded oblong obtuse, connected at the base by the wing of the rachis, pinnatifid below with small blunt shallow lobes which are bifid or toothed, toothed above with short blunt simple teeth; sori short, much curved, numerous, often becoming confluent. [Plate LIII A.]

ATHYRIUM FILIX-FŒMINA, *v.* MARINUM, *Moore, Pop. Hist. Brit. Ferns,* 1 ed. 91; *Id., Handb. Brit. Ferns,* 3 ed. 145; *Id., Ferns of Gt. Brit. Nature Printed,* t. 31 C.

Var. **latifolium:** fronds oblong-lanceolate spreading; pinnæ approximate or crowded; pinnules short stalked, flat, imbricate, obliquely-ovate, laciniate pinnatifid, deeply so at the base, toothed above, the teeth long acute; sori small curved, uniserial on each side of, and distant from the midrib. [Plate LIV A.]

ATHYRIUM FILIX-FŒMINA, *v.* LATIFOLIUM. *Babington, Man. Brit. Bot.* 3 ed. 413 (3). *Moore, Handb. Brit. Ferns,* 3 ed. 145; *Id. Ferns of Gt. Brit. Nature Printed,* t. 31 B.
ATHYRIUM LATIFOLIUM, *Babington, MS.*—not of Presl.
ATHYRIUM OVATUM, *Newman, Phytol.* iv. 368 (excl. syn. Roth, Newman, Presl); *Id., Phytol.* 1851, *App.* xii. (excl. syn. Hoffmann, Roth, Newman).

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ASPLENIUM FILIX-FŒMINA, β. LATIFOLIUM, *Hooker & Arnott, Brit. Fl.* 6 ed. 574. *Moore & Houlston, Gard. Mag. Bot.* iii. 262.

Var. **acuminatum**: fronds suberect, dwarfish, broadly lanceolate, bipinnate, pinnæ rather crowded, ending in a long serrated acuminate point; pinnules distinct but decurrent, linear-oblong often narrowed below, blunt at the apex, pinnatifid, the teeth of the lobes acute; sori numerous, near the midrib. [Plate LV A.]

ATHYRIUM FILIX-FŒMINA, *v.* ACUMINATUM, *Moore, Handb. Brit. Ferns*, 3 ed. 156.

Var. **incisum**: fronds drooping, broadly lanceolate, bi-subtripinnate; pinnæ broad oblong, tapering; pinnules linear-lanceolate distinct, deeply pinnatifid, the lobes somewhat distant, toothed at their margin and apex; sori numerous, near the midrib. [Plate LVI.]

ATHYRIUM FILIX-FŒMINA, *v.* INCISUM, *Newman, Hist. Brit. Ferns*, 2 ed. 243; 3 ed. 214. *Sowerby, Ferns of Gt. Brit.* 44. *Moore, Ferns of Gt. Brit. Nature Printed*, under t. 30; *Id., Handb. Brit. Ferns*, 3 ed. 149.
ATHYRIUM INCISUM, *Newman, Phytol.* 1851, *App.* xiii.; *Id., Hist. Brit. Ferns*, 3 ed. 214.
ATHYRIUM CYCLOSORUM, *Rupprecht, Dist. Crypt. Ross.* 41.
POLYPODIUM INCISUM, *Hoffmann, Rœm. and Ust. Mag. Bot.* 1790, pt. 9, 10, fig. 13 *b*; *Id., Deutschl. Fl.* ii. 7.

Var. **plumosum**: fronds drooping, broadly lanceolate, tripinnate; pinnæ crowded above, acuminate; pinnules ovate-acuminate overlapping, divided down to the slender marginate costa into distinct linear secondary pinnules, which are inciso-pinnatifid with narrow linear unequally bifid or three-toothed segments, the teeth linear acute; sori imperfect, oligocarpous, almost or quite without indusia. [Plate LII B; LVI *bis*.]

ATHYRIUM FILIX-FŒMINA, *v.* PLUMOSUM, *Moore MS.; Id., Phytologist*, new series, iii. (1859) 19.

Var. **gracile**: fronds lax, slender, bipinnate; pinnæ distant, caudately acuminate; pinnules distant on the slender rachides, linear-oblong, fringed in the upper half with linear acute teeth; sori crowded, near the midrib. [Plate LVIII.]

ATHYRIUM FILIX-FŒMINA, *v.* GRACILE, *Moore, Handb. Brit. Ferns*, 3 ed. 158.

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Var. **dissectum**: fronds stout, dwarfish, broadly oval, bipinnate; pinnæ oblong suddenly acuminate; pinnules distant, decurrent, unequal and irregular, mostly ovate-oblong, blunt, cut into distant unequally toothed lobes separated by broad open sinuses; sori near the costa, situate at the base of the sinuses. [Plate LX C; LX *bis*.]

ATHYRIUM FILIX-FŒMINA, *v.* DISSECTUM, *Wollaston MS. Moore, Ferns of Gt. Brit. Nature Printed*, under t. 30; *Id., Handb. Brit. Ferns*, 3 ed. 159.

Var. **rhæticum**: fronds narrow-lanceolate erect, bipinnate; pinnæ distant; pinnules distinct, deeply pinnatifid, lanceolate acute, becoming linear from the incurvation of the lobes; lower anterior lobe longer and auriculiform; sori short, numerous, near the midrib, becoming confluent. [Plate LVII A.]

ATHYRIUM FILIX-FŒMINA, *v.* RHÆTICUM, *Moore, Ferns of Gt. Brit. Nature Printed*, *t.* 31 A.; *Id., Handb. Brit. Ferns*, 3 ed. 144.

POLYPODIUM RHÆTICUM, *Linnæus, Sp. Plant.* 1552; according to the Linnæan Herbarium.

ASPIDIUM RHÆTICUM, *Sprengel, Syst. Veg.* iv. 107.

ASPIDIUM IRRIGUUM, *Smith*; according to specimens in his Herbarium (the figure in *Eng. Bot.* xxxi. t. 2199, rather resembles *molle*); *Id., Eng. Fl.* 2 ed. iv. 283. *Sprengel, Syst. Veg.* iv. 104.

ATHYRIUM RHÆTICUM, *Roth, Fl. Germ.* iii. 67. *Newman, Nat. Alm.* 1844, 26. *Moore, Handb. Brit. Ferns*, 2 ed. 136.

ATHYRIUM CONVEXUM, *Newman, Phytol.* 1851, *App.* xiii.; *Id., Hist. Brit. Ferns*, 3 ed. 212.

ATHYRIUM FILIX-FŒMINA, *v.* CONVEXUM, *Newman, Hist. Brit. Ferns*, 2 ed. 245; 3 ed. 212. *Babington, Man. Brit. Bot.* 4 ed. 425 (*a*).

ATHYRIUM IRRIGUUM, *Gray, Nat. Arr. Brit. Pl.* ii. 10.

ASPLENIUM FILIX-FŒMINA, *v.* RHÆTICUM, *Deakin, Florigr. Brit.* iv. 60.

Var. **polydactylon**: monstrous; fronds lanceolate, bipinnate, several times forked at the apex; pinnæ flat, their apices symmetrically bi-tri-furcate, with flat not crispy segments. [Plate LXIV B.]

ATHYRIUM FILIX-FŒMINA, *v.* POLYDACTYLON, *Moore, Ferns of Gt. Brit. Nature Printed*, under t. 30; *Id., Handb. Brit. Ferns*, 3 ed. 145, 153.

Var. **multifidum**: monstrous; fronds lanceolate, bipinnate, their apices and those of the pinnæ symmetrically multifid-crisped; the tassels consisting of numerous narrow slightly divergent segments; pinnules distinct, oblong, acute, convex. [Plate LXI.]

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ATHYRIUM FILIX-FŒMINA, *v.* MULTIFIDUM, *Moore, Handb. Brit. Ferns*, 1 ed. 94; 3 ed. 146, 153; *Id., Ferns of Gt. Brit. Nature Printed*, t. 33.
ATHYRIUM FILIX-FŒMINA, *v.* VIVIPARA, *Steele, Handb. Field Bot.* 215.
ATHYRIUM FILIX-FŒMINA, *v.* FURCATUM, of gardens.
ATHYRIUM FILIX-FŒMINA, *v.* CRISTATUM, *Wollaston MS.*

Var. **multiceps**: monstrous; fronds tall, broad lanceolate, bipinnate, their apices and those of the pinnæ symmetrically multifid-crisped; tassels all consisting of numerous narrow lacerate spreading divisions; pinnules oblong, unequal, inciso-serrate.

ATHYRIUM FILIX-FŒMINA, *v.* MULTICEPS, *Moore, Proceed. Hort. Soc. Lond.* i. 70.

Var. **corymbiferum**: monstrous; fronds tall, broad lanceolate, bipinnate, their apices and those of the pinnæ symmetrically multifid-crisped; tassels consisting of broad spreading tapered segments whose rachides are furnished with normal pinnules; pinnules very broad, oblong, obtuse, pinnatifid; stipes and rachis red. [Plate LXIII.]

ATHYRIUM FILIX-FŒMINA, *v.* CORYMBIFERUM, *Moore, Handb. Brit. Ferns*, 3 ed. 145, 155.

Var. **grandiceps**: monstrous; fronds suberect, bipinnate, divided at the apex into a broad multifid-crisped tasselled head; pinnæ pinnate, with short oblong pinnules and small terminal tassels; unsymmetrical.

Var. **depauperatum**: monstrous; fronds suberect, bipinnate, furcately divided at the apex in numerous narrow lacerate segments, forming loosely tasselled tufts; pinnæ small irregularly depauperated, unsymmetrically lacerate-tasselled at their apices; sori small. [Plate LXIV A.]

ATHYRIUM FILIX-FŒMINA, *v.* DEPAUPERATUM, *Wollaston MS. Moore, Ferns of Gt. Brit. Nature Printed*, t. 34 B; *Id., Handb. Brit. Ferns*, 3 ed. 146, 155.
ATHYRIUM FILIX-FŒMINA, *v.* RAMOSUM, *Moore & Houlston, Gard. Mag. Bot.* iii. 262. *Moore, Handb. Brit. Ferns*, 2 ed. 141.

Var. **acrocladon**: monstrous, dwarf, irregularly ramose, often twice branched, the apices of the branches dilated and multifid-crisped

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in dense tassels, having narrow projecting laciniately-toothed segments; sori small, scattered. [Plate LXV.]

ATHYRIUM FILIX-FŒMINA, *v.* ACROCLADON, *Clapham MS.*

Var. **crispum**: monstrous, dwarf, irregularly ramose, the apices of the branches and pinnæ dilated and multifid-crisped in compact obtuse tassels; sori small, scattered, often wanting. [Plate LXVI.]

ATHYRIUM FILIX-FŒMINA, *v.* CRISPUM, *Moore, Handb. Brit. Ferns.* 1 ed. 94; 3 ed. 146, 155; *Id., Ferns of Gt. Brit. Nature Printed*, t. 34 A.
ATHYRIUM FILIX-FŒMINA, *v.* SMITHII, of gardens.

Caudex stout, erect or decumbent, sometimes elongated and trunk-like, often tufted, scaly at the crown. *Scales* lanceolate or ovate-lanceolate, dark brown, sometimes almost black. *Fibres* strong, wiry, blackish, branched, the younger parts tomentose.

Vernation circinate, the apex in the partially developed fronds becoming liberated and bent downwards in a curve like that of a shepherd's crook.

Stipes terminal, and adherent to the caudex, from about one-third to one-fourth the entire length of the frond, pale green or dull purplish red, stoutish, much thickened just above the base, so as to become somewhat spindle-shaped, scaly; scales numerous on the lower part, lanceolate or linear, usually dark-coloured varying from dark reddish brown to almost black, fewer and narrower on the upper part, often contorted. *Rachis* channelled in front, rounded behind, and furnished sparingly with small narrow deciduous scales.

Fronds very variable in size, outline, and division, soft herbaceous, erect, spreading, or drooping, usually of a bright tender green, two or three feet in height, and from nine inches to a foot in breadth; the smaller mature states from one to two feet high, and from three to six inches broad. The outline is lanceolate, sometimes broad, sometimes narrowish. The less developed forms are scarcely bipinnate, the pinnules being connected by the winged rachis, but the more highly developed forms are bipinnate, the pinnules being distinct. *Pinnæ* numerous, pinnate, opposite or alternate, more distant below and there

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often deflexed, sometimes approximate sometimes distant above; linear-oblong, broadest at the base, gradually narrowing to a point. *Pinnules* oblong, or narrow-lanceolate, flat, obtuse or acute; sessile with a broad attachment; decurrent and confluent at the base; or with a very short narrowed stalk-like attachment; pinnatifid with shallow 2-3-toothed lobes at the base and simple teeth towards the apex, or deeply pinnatifid throughout with the lobes variously toothed, the teeth confined to the apices of the lobes, or extending along their sides, usually short and blunt-pointed, but sometimes lengthened and acute, though never normally bristle-pointed. The pinnules are sometimes merely patent, but they not unfrequently form a right angle with the secondary rachides; and while in some forms there is no appreciable difference in the proportionate size of the lobes, in others the lowest anterior lobe is considerably longer, giving the pinnules an auriculate appearance, the enlarged lobes forming a conspicuous line on each side the rachides of the pinnæ.

Venation of the pinnules, in the less divided forms, consisting of a flexuous *costa* or midvein, producing alternate *veins;* the lower of these are forked, a *venule* being directed into each tooth; the upper are simple, directed into the simple teeth at the apex of the pinnules. In these less divided forms, the anterior venule of each fascicle bears the sorus along its anterior side. When the pinnules are more divided, the *veins* from the *costa* are pinnately branched, several alternate *venules* being produced, the number corresponding with the number of teeth; the anterior venule is here also soriferous, so that a line of sori is produced on each side the costa, but in addition some of the other venules of the lower lobes bear sori. When the pinnules become very deeply divided, as in the most compound states of the plant, each vein produces several fertile venules, and the sori then form two lines along the lobes. The veins and venules terminate in a slightly attenuated point just within the apex of the tooth towards which they are directed.

Fructification on the back of the frond, dispersed over the whole under surface. *Sori* numerous, short, indusiate, medial; usually occupying the anterior side of the anterior venules in the less divided forms, and then often straight and oblong, but the receptacle of the lowest one (or more) generally crosses the venule and forms a

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curved semilunate or hook-topped sorus, or sometimes also returns along the posterior side of the venule and forms a short hippocrepiform or horse-shoe-shaped sorus. In the more divided examples, this short equally-curved form of sorus is more frequent, and sometimes in the very much divided fronds it is even more abundant than the simple oblong or semilunate form. In this latter state, the fructification might at a cursory glance be mistaken for that of *Lastrea*. The sori are at first distinct, but generally become more or less confluent by the spreading of the crowded spore-cases. *Indusium* membranaceous, variable in outline according to the form taken by the sorus, the free margin cut into capillary segments, and eventually becoming "repressed" or held back by the crowded mass of spore-cases. *Spore-cases* numerous, dark brown, obovate. *Spores* oblong, granulate or muriculate.

Duration. The caudex is perennial. The fronds are annual, appearing about May, and being destroyed by the first frosts, decaying early in the autumn even when protected against frost.

This plant is the type of the genus *Athyrium* as here understood, consisting of asplenioid ferns, in which the sorus returns more or less on the posterior side of the receptacular vein, and becomes hooked or hippocrepiform, the attachment of the indusium being as in the *Aspleniæ* along the side of the vein.

The Lady Fern is not easily confounded with any other British species. Though related to *Asplenium*, and referred to that genus by many talented botanists, it is at once distinguished from all the British *Aspleniums* by its herbaceous texture, its annual fronds, and its whole habit, as well as by the curved or arcuate sori. On the other hand, these curved or hippocrepiform sori connect it in some degree with *Lastrea*, and it was no doubt the examination of specimens with advanced fructifications of this form which led to its being associated, as it was formerly, with *Aspidium*. The plant is not, however, sufficiently like any native species of *Lastrea* to be mistaken for one of them.

The Lady Fern is a common and generally distributed species, attaining its greatest degree of luxuriance in damp, shady, and

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sheltered places. Sometimes it is found in more open as well as in rocky situations, though generally where it is well supplied with moisture; but warm moist woods and damp hedge-row banks are its favourite localities, a fact which Scott thus happily expresses:—

"Where the copse wood is the greenest,
Where the fountain glistens sheenest,
Where the morning dew lies longest,
There the Lady Fern grows strongest."

It is when growing in such situations, that it most fully supports the claim of supremacy in beauty over all the other native species, which is made in its behalf. "Dull indeed," Mr. Newman very justly remarks, "must be the perception, and cold the heart, that fails to appreciate its excessive loveliness;" and Mr. Edwin Lees, in his *Botanical Looker-out*, has some lines which claim for this plant a position, which few if any will dispute:—

"When in splendour and beauty all Nature is crown'd,
The Fern is seen curling half hid in the ground,
But of all the green brackens that rise by the burn,
Commend me alone to the sweet Lady Fern.

"Polypodium indented stands stiff on the rock,
With his sori exposed to the tempest's rough shock;
On the wide chilly heath Aquilina stands stern,
Not once to be named with the sweet Lady Fern.

"Filix-mas in a circle lifts up his green fronds,
And the Heath Fern delights by the bogs and the ponds;
Through their shadowy tufts though with pleasure I turn,
The palm must still rest with the fair Lady Fern.

"By the fountain I see her just spring into sight,
Her texture as frail as though shivering with fright;
To the water she shrinks—I can scarcely discern
In the deep humid shadows the soft Lady Fern.

"Where the water is pouring for ever she sits,
And beside her the Ouzel, the Kingfisher flits;
There, supreme in her beauty, beside the full urn,
In the shade of the rock stands the tall Lady Fern.

"Noon burns up the mountain; but here by the fall
The Lady Fern flourishes graceful and tall.
Hours speed as thoughts rise, without any concern,
And float like the spray gliding past the green Fern."

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The plant is common all over England, and abundant, though perhaps less so, in Scotland and Wales, whilst in Ireland it is of very frequent occurrence, and the Northern, Western, and Channel Islands all produce it. In elevation its range extends from the coast level to an altitude of about 3000 feet, in the Highlands of Scotland. It is an exceedingly variable species, but the common forms, such as *molle*, *incisum*, and *rhæticum*, with the intermediate states, are widely dispersed and sufficiently frequent to lead to the conviction that they are general in their occurrence. Though assuming so many forms, we believe the species to be by no means fickle; for, most of the forms which have been introduced to cultivation, and they are not a few, are quite constant. The variety *rhæticum*, which occurs all over Great Britain and Ireland, and is found in its characteristic form in more or less exposed boggy situations, is, perhaps, the one most liable to change when submitted to opposite influences, but even this is generally distinguishable from the form called *incisum*, to which it approaches under the influence of shade and shelter. The singular monstrous forms in which the Lady Fern masquerades, are remarkable for their elegance as well as for their permanence, and are valuable on account of the variety they afford as cultivated plants. The following is a sketch of its distribution:—

Peninsula.—Cornwall: Travenna, &c. Devonshire: Ilfracombe, various forms, *Rev. J. M. Chanter;* Salterton; Dartmoor (*molle*), *Rev. C. Trelawny;* Marwood (*molle, trifidum*), *Rev. F. Mules;* Barnstaple (*trifidum*), *C. Jackson;* Exeter (*trifidum*), *R. J. Gray.* Somersetshire: Bristol; Nettlecombe; Inglishcombe Wood (*trifidum*), *R. Withers.*

Channel.—Isle of Wight. Hampshire: Basingstoke (*trifidum*), *F. Y. Brocas;* Mapledurham, near Petersfield, *J. Goodyer*, 1633. Dorsetshire. Wiltshire: Alderbury Common, Salisbury (*trifidum, molle*), *W. Moore.* Sussex: near Tunbridge Wells; Tilgate Forest, and elsewhere.

Thames.—Hertfordshire. Middlesex. Kent: Tunbridge Wells (*molle*), *Mrs. Delves;* (*trifidum*), *Miss Bower.* Surrey: Portnall Park, Virginia Water; Bagshot (*molle*), *P. F. Keir;* Shirley; Mayford (*molle, trifidum*); Gomshall, and other parts. Berkshire: Windsor Park. Buckinghamshire: Black Park. Oxfordshire. Essex.

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Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Huntingdonshire. Northamptonshire.

Severn.—Warwickshire: Arbury Park, and other parts. Gloucestershire. Herefordshire: Ross; Hereford, *G. Dale.* Monmouthshire: Newport. Worcestershire: Malvern (*trifidum*). Staffordshire: Darlaston Hall. Shropshire: Titterstone Clee; Bickley, near Shrewsbury, &c.

Trent.—Leicestershire. Lincolnshire. Nottinghamshire. Derbyshire: Chatsworth. Rutland: Belvoir Woods.

Mersey.—Cheshire. Lancashire: Boghart Hole Clough, near Manchester (*trifidum*), *Rev. W. A. Leighton;* Penketh, *T. G. Rylands* (*trifidum* form); Clitheroe; Chaigeley Manor (*molle, trifidum*), *E. J. Lowe;* Todmorden.

Humber.—Yorkshire: Mickley Barrows; Hebden Bridge, near Halifax (*molle*), *S. Gibson;* Sheffield (*trifidum*), *Rev. W. A. Leighton;* Bradford, *J. T. Newboult.*

Tyne.—Northumberland: Hexham (*molle*), *Rev. J. Hand.* Durham.

Lakes.—Cumberland: Keswick (*trifidum* and various other forms, abundant), *Miss Wright.* Westmoreland: Ambleside; Windermere. N. Lancashire: Conistone, various forms, *Miss Beever.* Isle of Man.

S. Wales.—Radnorshire. Brecknockshire. Glamorganshire: Llandaff (*molle*), *Miss Lewis.* Carmarthenshire. Pembrokeshire: Castle Malgwyn (*trifidum,* and other forms), *W. Hutchison.* Cardiganshire.

N. Wales.—Anglesea: Cickle (*trifidum*), *Rev. W. A. Leighton.* Denbighshire: Ruthin (*molle, trifidum*), *T. Pritchard;* Voil Famma (*molle*), *T. Pritchard.* Flintshire. Montgomeryshire: Craig Breidden (*molle*), *Rev. W. A. Leighton.* Merionethshire. Carnarvonshire: Aber, &c.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrewshire. Lanarkshire. Wigtonshire. Ayrshire.

E. Lowlands.—Edinburghshire. Roxburghshire: Jedburgh. Berwickshire. Peebles-shire. Selkirkshire. Haddingtonshire. Linlithgowshire.

E. Highlands.—Clackmannanshire. Fifeshire. Stirlingshire: Ben Lomond. Forfarshire: Sidlaw hills, and other parts. Kinross-

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shire. Perthshire: Dunkeld (*molle*); Pass of Trosachs (*trifidum*), *T. M.*; Callender, *T. M.*; Ben Lawers (*molle*); Killin (*molle*), *W. Pamplin*; Dalnacardoch, &c. Kincardineshire. Aberdeenshire: Braemar; Aberdeen, and elsewhere. Banffshire. Nairnshire. Morayshire.

W. Highlands.—Inverness-shire: Ben Nevis. Argyleshire: Hell's Glen, Lochgoilhead; Ardrishiag (*molle*), *Miss F. Griffith*; Glen Gilp (*trifidum*), *T. M.*; Glen Croe. Dumbartonshire: Tarbet (*molle*), *T. M.* Isles of Islay; Cantyre; Arran (*molle, trifidum*).

N. Highlands.—Ross-shire. Cromarty. Sutherlandshire. Caithness.

N. Isles.—Shetland. Orkney, common, *T. Anderson.*

W. Isles.—N. Uist. Harris. Lewis.

The species is very common in Ireland.

Ulster.—Antrim: Malone, near Belfast (*molle*). Down: Mourne Mountains. Donegal: Gweedore, *R. Barrington*; Killybegs (*molle, trifidum*), *R. B.*; near Lough Eske (*trifidum*), *R. B.*

Connaught.—Galway: Connemara; Gort (on limestone), *J. R. Kinahan*; Kylemore, *R. Barrington*; Moycullen (*molle*), *R. B.* Sligo: Ben Bulben; Lough Gill (*molle*), *R. Barrington.* Mayo: Westport; Ballycroy; Isle of Achil, *R. Barrington.* Leitrim: Glen Car (*molle, trifidum*), *R. Barrington.*

Leinster.—Wicklow: Glen Cullen; Valley of the Dingle, *R. Barrington.* Louth. Dublin (on granite): Castle Kelly; Glendruid, *R. Barrington.* King's County. Kilkenny.

Munster.—Cork. Kerry: Cahir Conree, near Tralee; Mucruss, Killarney, *N. B. Ward.* Clare: Lisdoonvarna (*molle*), *R. Barrington.* Waterford: Carthy's Cove. Tipperary: Keeper Hill. Limerick, *J. R. Kinahan.*

Channel Isles.—Jersey. Guernsey, *C. Jackson.*

In one or other of its forms, this protean species spreads over Europe, from Lapland through Scandinavia, Russia, Great Britain, Holland, Belgium, France, Switzerland, Germany, Hungary, Croatia, Transylvania, Italy, Spain, and Portugal, to Greece and Crete, extending to the Caucasus and the Ural Mountains. It spreads over northern or Russian Asia from the Trans-Caucasian provinces and

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the Ural range, to the Altai, Dahuria, and the east coast of Siberia; and extends from north-western India, Kumaon, and the Sikkim Himalaya, to the Mediterranean. In Africa it is found in Algeria, and in the Islands of Teneriffe, Madeira, and the Canaries; while an Abyssinian plant collected by Schimper (*Nos.* 741, 1270) and distributed as a variety of *Athyrium Filix-fœmina*, is probably distinct, as it has a creeping caudex. It is widely diffused in North America, being found in Kamtschatka, at Sitka and Unalaschka, at Awatschka Bay, on the Saskatchawan river, and in the Rocky Mountains; in British Columbia; in Canada, and throughout the United States—where also occurs a closely allied plant, *Athyrium asplenioides* (of which *A. angustum* is a variety), differing in having a creeping caudex. Ruprecht's *Athyrium cyclosorum* from Petropaulowski, Unalaschka, and Kodiak, as well as from Lapland, is probably the same with our compound forms having short much curved sori. In South America moreover, occur forms which we refer to *Athyrium Filix-fœmina*—from Bolivia, from Cuba, from the Caraccas, and from Vera Cruz. The forms from these foreign habitats are various, as those are which are found in Britain, but the exotic variations are quite analogous to those which occur in this country, those corresponding to the forms called *molle*, *ovatum*, *frondosum*, *laxum*, and *rhæticum* in particular, occurring the most frequently in the specimens we have examined.

The different forms of the Lady Fern are easily cultivated. All the larger growing varieties may be planted with success in good light loamy or peaty soil, which is all the better for being enriched by leaf-mould. They all like plenty of moisture, and for the most part delight in shade and shelter. Some of the smaller abnormal forms, are rather apt to sustain injury from too much confined dampness about the crowns, if kept under glass in winter; and these are also liable to suffer from exposure to the rigours of our climate in severe winters. The stronger growing normal forms are, on the other hand, thoroughly hardy. All the forms of Lady Fern, however, do well under glass, and if not kept too warm, they may be had in this way in a very characteristic state, and in much beauty. The species in its varied phases may be considered one of the most beautiful of the larger deciduous native Ferns.

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The Lady Fern does not appear to be applied to any important use. It is, however, frequently employed in packing both fish and fruit for transmission to market, and is even more suitable for this purpose than the bracken which is sometimes made use of in a similar way.

What is wanting in utility is however amply compensated by its beauty, for the plant is undoubtedly pre-eminent among our native ferns in this rare quality; and as such, has elicited from poets' pens the very highest praise. Thus Calder Campbell, in some lines written for Miss Pratt's volume, on *The Ferns of Great Britain and their Allies:*

"Go look for the Pimpernel by day,
For Silene's flowers by night;
For the first loves to bask in the sunny ray,
And the last woos the moon's soft light:
But day or night the Lady Fern
May catch and charm your eyes,
When the sun to gold her emeralds turns,
Or the moon lends her silver dyes.
But seek her not in early May,
For a Sibyl then she looks,
With wrinkled fronds that seem to say,
'Shut up are my wizard books!'
Then search for her in the summer woods,
Where rills keep moist the ground,
Where Foxgloves from their spotted hoods,
Shake pilfering insects round;
Where up and clambering all about,
The Traveller's Joy flings forth
Its snowy awns, that in and out
Like feathers strew the earth:
Fair are the tufts of Meadow-sweet
That haply blossom nigh;
Fair are the whorls of violet
Prunella shows hard by;
But nor by burn, in wood, or vale,
Grows anything so fair
As the plumy crest of emerald pale,
That waves in the wind, and soughs in the gale,
Of the Lady Fern, when the sunbeams turn
To gold her delicate hair."

We include in what we have taken as the typical form of *Filix-fœmina*, the plants known sometimes as the varieties *molle* and *trifidum*, these being the commoner moderately developed forms in

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which the species is met with. The form called *molle*, which we take to be the *A. molle* of Roth, is a dwarfish plant, growing from one to two feet high, of lax habit, and having rather distant pinnæ. The pinnules are oblong bluntish, having a broad attachment, and are more or less obviously connected at the base by the narrow wing of the rachides; they are pinnatifid, the lobes oblong, and the lowest two or three-toothed, the rest notched or simple. The larger states of this form, in which the pinnules become more distant, rather less conspicuously united at the base, and rather more deeply toothed, correspond with an authentic specimen of the *Polypodium molle* of Schreber, in the Smithian herbarium. It is a common plant, and is met with under several conditions, differing in size and in the degree of toothing and of confluence in the pinnules, the larger forms merging into *trifidum*. This latter, believed to be the *A. trifidum* of Roth, is a somewhat larger plant than *molle*, and equally common. The pinnules are in this case more distinct, oblong-lanceolate in form, rather larger at the base on the anterior side, and cut half way to the midrib into lobes, the majority of which, in the more characteristic plants, are entire at the edges, and three-toothed at the apex. The sori are near to the midrib, and often become confluent. A general view of the distribution of these forms, representing the common state of the Lady Fern, has already been given.

The Lady Fern is, perhaps, of all our British species, the most prolific of varieties; and these varieties are often very marked. Taking the moderately divided forms above noted as types of the species, we find one series of forms differing in having their pinnules much more confluent or united, and another conspicuously distinct in having their pinnules much more divided, the forms belonging to the latter group being unquestionably among the most elegant of our wild Ferns. There are also considerable differences in the fructification, running nearly parallel with the differences in the division of the fronds, but in some forms very highly developed as regards the frond itself, the fructification has not hitherto been discovered otherwise than in an abortive state. These are differences which occur among what may be considered as the normally developed forms of the species. The long series of abnormally developed

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forms occurring in this plant, includes various elegantly laciniated, crisped, and tasselled varieties, which are in many cases singularly beautiful.

Sometimes it has been found rather difficult to assign exact limits to the varieties, since in certain cases they pass by intermediate forms the one into the other; but after having for several years cultivated many of the plants, and given much attention to the subject, we are compelled to adopt the conclusion that there is much of permanence and constancy, at least under cultivation, among the forms which scientific men are prone to repudiate as 'sports.' We have ourselves rediscovered several recognisable common forms, in wild habitats even though after a lapse of six or eight years they had attained an increase of vigour, so that the variations in these cases were at least not the result of difference of age; and we have removed others to the garden, and have not found them to vary beyond the acquisition of an increase of vigour under cultivation. Every part of the plants —the scales, the stipites, the outline and direction of the fronds, the form attachment and direction of the pinnules, and the size and position of the sori—is so subject to change, that it is difficult to determine what peculiarities are of the highest value in endeavouring to set limits to the varieties; and for this reason, comparatively few of the forms below enumerated are considered to have any other botanical importance than that of proving the variability of what are called species. They are, however, of extreme interest to amateur cultivators; and hence we have thought it better to notice all that were known to us, rather than to cast the most puzzling aside as being 'diseased' or 'malformed' plants, and thus virtually to ignore their existence.

Normal Series.

1. *confluens* (M.). This variety has a peculiar rigid erect appearance. It grows nearly a foot in height, and is narrow-lanceolate, subbipinnate, with the pinnæ somewhat distant; the longest pinnæ are an inch or rather more in length, and irregular in outline. In the fronds produced during several years after its discovery, the basal pinnule was distinct, with shallow two or three-toothed lobes, and stood rather distant from the rest, which were crowded, confluent at the base, and

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pinnatifidly lobed, with distinct blunt teeth. When first found these confluent pinnules were also considerably reduced in size, and the frond was smaller. The more perfect and vigorous fronds now produced, have the pinnules more regular in position, and mostly with a narrow attachment, though connected by the margined rachis. The perfect basal anterior pinnules are stipitate, ovate, deeply pinnatifid, the segments rather obovate, with a few coarse acute teeth; the other pinnules are similarly lobed and toothed but smaller, and in some cases depauperately so. The sori are scattered and irregular, and produced on the lobes near the base of their anterior margin, but distant from the midrib. Occasionally, as seen in our figure, a pinna is met with reduced to an awl-shaped rib. This very remarkable form was found by Mr. A. Tait, of Edinburgh, "in the seam of a perpendicular rock, on the side of one of the pine-covered mountains near Dunkeld," in 1853. [Plate LIII B; LIII *bis*, A.]

2. *alatum* (M.). A dwarf variety, with something of the aspect of *marinum*, but much more confluent. The fronds are of drooping habit, delicate in texture, lanceolate, with small deflexed lower pinnæ; the pinnæ rather more than an inch long in the centre of the fronds, narrowing from the broad base to the blunt rounded apex; pinnatifid nearly to the rachis at the base, more confluent upwards, so that the pinnules or segments are everywhere connected by a broad distinct wing to the rachis. The pinnules are crowded, and even overlapping, as broad above as below, the apex rounded, and the margin notched with acute prominent teeth. The sori are short, and in the specimens we have seen confined to the lowest veins in each segment. It was found a year or two since on Loch-na-gar in company with *Polypodium alpestre*, and is in the possession of Mr. A. Tait, of Edinburgh. [Plate LIII *bis*, B.]

3. *marinum* (M.). This variety, sometimes called Dickie's Lady Fern, is a small plant, generally to be known by the elliptic-lanceolate outline of its fronds and by its crowded oblong pinnules, which are connected at the base, and notched with blunt shallow teeth, which latter in many fronds are, for the most part, simple and regular. It differs also from the usual forms of the species in having the fronds spreading or decumbent in habit. The scales produced at the base of the

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stipites are of a very dark brown, almost black. The fronds are from a foot to a foot and a half long, spreading or sub-decumbent, rigid, scarcely bipinnate; they are exactly lanceolate, the shortening of the pinnæ from the centre of the frond being equal towards both the base and apex. The pinnæ narrow but little for about two-thirds of their length, but beyond this they contract into a somewhat acuminate point; the upper pinnæ are spreading, the lower ones deflexed. The pinnules, often largest next the main rachis, are oblong, blunt and rounded at the ends, crowded or slightly overlapping, connected by a narrow wing, set on at a right angle, or sometimes a little reflexed; the margin is rather toothed than lobed, the indentations being shallow, and the projections in the upper half being seldom more than blunt simple or somewhat retuse notches, though below they are generally two or three-toothed; sometimes the lobes become rather more developed. The sori are lunate, or with a strong tendency to assume the arcuate or horse-shoe-shaped form, and are ranged near the costa in a double line along the pinnules, sometimes distinct, but often becoming confluent. This variety is a very neat-growing plant, constant to the above-mentioned peculiarities. It was originally found by Dr. Dickie in a cave by the sea, in the neighbourhood of Aberdeen; and a plant almost exactly resembling it, has since been gathered by Dr. Allchin, in the Isle of Man. [Plate LIII A.—Folio ed. t. XXXI C.]

4. *minimum* (M.). A remarkably dwarf form, the fronds being not more than six inches long and less than an inch and a half broad. They are bipinnate, the lower pinnules being tolerably distinct, the upper ones more or less decurrent and confluent at the base; the pinnæ are rather irregular, and taper-pointed; the pinnules are oblong, narrowed and acutish upwards, deeply pinnatifid with toothed lobes below, and inciso-dentate above, the teeth narrow and acute. The narrow prominent teeth produce a fringed appearance. The anterior basal lobe is sometimes larger, and the pinnules are altogether irregular in size and development, but not sufficiently so to produce a depauperated aspect. The sori are short and irregular, produced chiefly at the base of the pinnules. It was found at Ilfracombe, and has been cultivated for several years by Mr. Young of Taunton.

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5. *latifolium* (Bab.). This is a peculiar-looking variety of Lady Fern, and being like other varieties reproduced from the spores, we cannot, as some have done, regard it as a nonentity. Its most remarkable peculiarities consist in the irregular outline of the pinnæ, in the densely crowded condition and unequal size, as well as uneven toothing or laciniation of the pinnules, and in the situation of the sori. The fronds are three feet or more in height, bipinnate, oblong-lanceolate, flaccid, and of a dark green colour. The stipes is about the average length, scaly especially below, stout; the rachis also is stout. The pinnæ are short, and distant below, approximate or even crowded upwards, alternate, linear-oblong, irregular in outline, with a tendency to become cuspidate at the apex. The pinnules are ovate, or oblong-ovate, blunt or acute, flat, unequal in size, oblique, the anterior side being largest, stalked or having a narrow stalk-like attachment, overlapping; they are laciniate-pinnatifid, deeply so at the base, the lobes oblong and irregularly toothed; the lobes become smaller upwards, and eventually towards the apex merge into long acute teeth, the teeth being usually unequal in size; the peculiar toothed margin produces a fimbriated appearance. The veins are branched in the manner already described, and the sori are produced on the anterior side of the lowest anterior venule; but the vein becomes branched at a greater distance from the midvein than is usually the case, and thus the sori are ranged in two distant lines, about midway between the midvein and the margin; they are small and conspicuously curved. This variety was found by Miss Wright, near Keswick, in Cumberland, where but a plant or two was discovered; and it does not appear to have been met with elsewhere. It is a very graceful variety of vigorous habit. [Plate LIV A.—Folio ed. t. XXXI B.]

6. *conioides* (App.). This form grows about a couple of feet in height, and its pale-coloured stipites are furnished with light brown scales. The fronds are broad lanceolate, and in the outline and cutting of their divisions have a certain resemblance to the leaves of the hemlock, whence the name. The pinnæ are irregular in outline, rather distant and more or less acuminate; the pinnules are variable in size and outline, usually ovate, sometimes oblong, decurrent at the base, somewhat distant, notched with shallow

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distant lobes almost to the apex, the lobes again notched with small short teeth. When fertile the pinnules become tapered to an acute point, and the lobes are narrowed and more distant; forked or ramose pinnules are not uncommon. The sori are produced about the base of the lobes, and thus form a line about parallel with the sinuses. It was found by Mr. S. Appleby, at Cantley, near Doncaster.

7. *acuminatum* (M.). A very curious and pretty dwarf variety. It has short stipites furnished with narrow contorted pale-coloured scales. The fronds are rather more than a foot high, broadly lanceolate. The pinnæ are somewhat crowded, short and deflexed below, the longer ones each ending in a longish serrated acuminate point. The pinnules are distinct but decurrent, linear-oblong, often narrowed below, blunt at the apex, numerous, patent, pinnatifid in the lower part, and cut around the blunt apex into longish acute teeth; the teeth of the lobes are also acute. The sori are numerous, in lines near the costa. It is altogether a slender-looking and elegant plant, its peculiarities consisting in its acuminated pinnæ, and narrow oblong pinnules. The plant was gathered some years since on Snowdon, by Mr. W. Pamplin, and is quite constant under cultivation. [Plate LV A.]

8. *stenodon* (M.). A very elegant dwarf or dwarfish form, varying from one foot to a foot and a half in height. The stipites are dull red, and furnished with tawny brown scales. The fronds are lanceolate, with right-angled oblong acuminate pinnæ. The pinnules are approximate, oblong or linear-oblong, bluntish, united by a narrow wing along the rachis, unequal sized, pinnatifid below with toothed lobes, simply toothed above, the teeth narrow, regular, and somewhat elongated. The rachis is stoutish, pale dull red. It has been communicated from—Surrey: Gomshall, *E. Morse*. Devonshire: Ilfracombe, *Rev. J. M. Chanter*. Yorkshire: Scarborough, *A. Clapham*. The scales, in a closely allied plant from Devonshire, are black. Sometimes the pinnules are of very unequal length, and the teeth are enlarged, in which state it somewhat resembles *laciniatum* (35). The fine elegant toothing is remarkable. [Plate LIII C.]

9. *tenue* (M.). This variety is of medium size, and is chiefly remarkable for its slender drooping character. The fronds are about a foot and a half long, broad-lanceolate, bipinnate.

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The pinnæ are distant, caudately acuminate. The pinnules are also distant, narrow-oblong, bluntish, pinnatifid, but the lobes shallow and short-toothed, the apical teeth being also small and short; the basal ones are placed close to the main rachis, so that the pinnæ are quite sessile. Found by Mr. Clapham, at Scarborough, and reported to be a very constant form under cultivation. Another slender form agreeing with this in the lax habit, sessile, caudate pinnæ, and narrow distant pinnules, has been communicated by Mr. Stansfield, of Todmorden. In this, however, as observed in the fronds of *stenodon*, the pinnules are of unequal length, with exaggerated teeth, but the Todmorden and Scarborough plants appear to be only different states of one slender distant-pinnuled variety.

10. *excurrens* (M.). A curious form, the general appearance of which is that of *molle*, but with rather distant decurrent pinnules. Its peculiarity consists in the points of the pinnæ, and sometimes of the pinnules and teeth, growing out into transparent hair-like points, which have the appearance of being an excurrent growth of the veins. It was found at Tunbridge Wells in 1853, and is cultivated by Mr. Wollaston. A plant of similar aspect, but without the excurrent points, has been found near Ilfracombe, by the Rev. J. M. Chanter. [Plate LV B.]

11. *pruinosum* (M.). A singular variety, resembling the moderately developed growths of *molle* or *trifidum*, but the stipites and rachides are covered with small glands, which give them a hoary appearance somewhat resembling pubescence. It occurs with red stipites, at Tarbet, in Dumbartonshire, where we gathered it in 1855; this form, resembling *trifidum* in its general aspect, having linear-oblong approximate acutish pinnules, has since continued constant to its peculiarities. A very similar plant was gathered by Dr. Allchin in the Isle of Man. Another pruinose state of the Lady Fern, rather more lax in habit, with blunter shorter pinnules and the aspect of *molle*, but having pale green stipites, has been found by Dr. Allchin at Virginia Water, Surrey.

12 *odontomanes* (M.). This is one of the smaller forms, growing from a foot to a foot and a half high. The fronds are broadly lanceolate, and are remarkable for their long conspicuous teeth. The

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pinnæ are short, broad, and acuminate; and the pinnules are rather distant, patent, decurrent at the posterior base, deeply pinnatifid, the lobes toothed with elongated or linear acute irregular teeth. The most marked form, which we consider typical of the variety, was sent from Conistone, by Miss S. Beever. It varies from this to a narrow lanceolate form, with short acutish not acuminate pinnæ, and having the basal pinnule only pinnatifid with long acute teeth, the rest of the pinnules being small, combined, scarcely divided at the sides, but conspicuously long-toothed at the apex. A very elegant form of this character has been found at Thirsk, by Mr. R. Foxton. Between these extremes various intermediate forms are found. The variety may be regarded as a long-toothed, smallish, sometimes narrow, form of the *molle* group. We have seen specimens from—Kent: Tunbridge Wells, *Mrs. Delves*. Surrey: Virginia Water, *Dr. Allchin;* Dorking, *W. Pamplin*. Devonshire: Challacombe, *Rev. F. Mules;* Marwood, *F. M.;* Barnstaple, *H. F. Dempster*. Staffordshire: Trentham Park, *G. B. Wollaston*. Shropshire: Titterstone Clee Hill. Lancashire: Prescott, *R. Morris;* Todmorden, *A. Stansfield*. N. Lancashire: Conistone, *Miss S. Beever*. Yorkshire: Thirsk, *R. Foxton*. Denbighshire: Ruthin, *T. Pritchard*. Glamorganshire: Llandaff, *Miss Lewis*. Dumbartonshire: Tarbet, *T. M.* Argyleshire: Glen Croe, *T. M.;* Ardrishiag, *Miss F. Griffith*. Bute: Rothesay, *T. M.* Kincardineshire: Cove, *A. Tait*. Clare: Lisdoonvarna, *R. Barrington*. [Plate LIV B.]

13. *ovatum* (Roth). This variety is the more readily identified, from being figured by Müller. It grows from two and a half to three feet high, and has broad lanceolate rather lax fronds. The pinnæ are rather distant, linear-oblong, narrowed to an acuminate point. The pinnules are shortish, ovate-oblong, distinct, broad at the base with a narrow attachment, narrowed but obtuse at the point, flat, their anterior side rather largest, pinnatifid, but not very conspicuously divided, the lobes furnished with short bluntish teeth. The sori are placed in two lines near the midrib, and a tendency is shown to develope more than one on the basal lobes. This form, which approaches *incisum*, but is not so much divided, having broader less-divided looking pinnules, does not appear to be very frequent; we have specimens from—Surrey: Virginia Water,

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Dr. Allchin; Mayford, *T. M.* Hampshire: Basingstoke, *F. Y. Brocas.* Denbighshire: Ruthin, *T. Pritchard.* Dumbartonshire: Tarbet, *T. M.* [Folio ed. t. XXXII.]

14. *obtusum* (M.). This variety has broad lanceolate fronds, about two feet high, the leafy portion being about half as broad as long. The pinnæ are broadish and tapering. The pinnules are flat, distinct, obliquely and very obtusely ovate-oblong, somewhat decurrent behind, cut into a few broad variously-toothed lobes, the teeth short and bluntish; they have somewhat the appearance of blunt pinnuled forms of *Lastrea dilatata.* The sori form two lines nearer the midrib than the margin. It was found at Virginia Water, in Surrey, by Dr. Allchin. A nearly related plant has been sent from Todmorden by Mr. Stansfield.

15. *frondosum* (M.) This is a larger and more compound state than the preceding, growing from two to three feet high, and having very broad lanceolate fronds, with broad approximate pinnæ, and crowded pinnules. The fronds have thus a more crowded and leafy appearance than usual. The pinnæ are irregular in outline, gradually narrowing to a long taper point. The larger pinnules are sometimes nearly or quite an inch long, and fully three-eighths of an inch in breadth; they are pyramidal, pinnatifid nearly to the midrib, the lobes blunt oblong toothed, the lowest anterior ones frequently bearing half-a-dozen sori, sometimes more, and most of the lower lobes several. In these sori the tendency to become arcuate is strongly marked, the one placed nearest the midvein of the pinnule, on each lobe, being uniformly horse-shoe-shaped. The stipites and rachides are quite red in plants we have met with at Mayford, in Surrey. The same variety has been sent from—Denbighshire: Ruthin, *T. Pritchard;* and Somersetshire: Nettlecombe, *C. Elworthy.*

16. *latipes* (M.). A very remarkable variety, with pyramidal or elongate-triangular fronds, which are rather above two feet in height, and about nine inches across the base where it is broadest. The stipes is about ten inches or a foot long; and the pinnæ are broad, two inches or upwards in width, and somewhat irregular. The pinnules are large and coarse-looking, the full-sized ones averaging two inches in length or upwards, the lowest sessile, the rest more or less adnate and decurrent, distinct, pointing forwards, ovate-lanceo-

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late, deeply pinnatifid into large distant lobes which point forwards, and are irregularly and coarsely toothed. The sori are remarkably large and mostly hippocrepiform or hamate. It was found by Mr. S. Appleby, in the neighbourhood of Doncaster, Yorkshire.

17. *dareoides* (M.). This very singular variety was discovered in 1854, near Castle Kelly, in the county of Dublin, Ireland, by Dr. Kinahan, who describes the pinnules to be pinnatifid, the indentations or lobes being entire at their edges, and bearing the sori in the angle, so that the spore-cases project beyond the edge of the frond; this, added to the bulging forwards of the substance of the pinnule, gives the plant much the appearance of a *Darea*, differing, however, from that sub-genus in the real structure of the fructification, though the segments often bear but a single vein and sorus. The Irish plant seems very rare, and is only known to us from the above memoranda, communicated by Mr. Wollaston, who, at first, through some misconception, named it *davallioides*. A very elegant form communicated from Todmorden, by Mr. Stansfield, is, however, no doubt the same variety, especially as it agrees in the very remarkable character of producing in parts of the fronds only a single vein and sorus in the segments. The specimen of this lying before us is about one foot and a quarter long (stipes wanting), nine inches broad, ovate-lanceolate, the pinnæ approximate, the pinnules rather distant. The pinnæ are broadish linear-oblong, tapering to a longish point, and overlap each other. The pinnules are distinct, ovate-oblong, deeply pinnatifid, with narrow lobes toothed only at the end, and very open sinuses. Some of these lobes have only a single vein, with the sorus on a short fork near the base; others have from two to four branch veins. The sori are small, and form a single row on each side of and near to the costa, and just abutting on the sinus. It is a very curious and distinct plant.

18. *incisum* (Hoffm.). This form or variety represents the species in one of its highest states of development, the pinnules being often so deeply divided that the fronds become almost tripinnate. It is usually a large growing plant, with broad drooping feathery and very handsome fronds. Three to four feet is not an uncommon height for it. In one example now before us, the height is about five feet, and the breadth one foot, the pinnæ which are ascending

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being quite nine inches long, and the pinnules an inch and a half long, and five-eighths of an inch wide at the base. This variety, as might be expected in so compound a plant, puts on many appearances, but in one or other of its conditions, is not infrequent. The fronds are broad lanceolate ; the pinnæ broad oblong, tapering to a slender point ; the pinnules linear-lanceolate, distinct, deeply pinnatifid, the lobes somewhat distant forming open sinuses, and toothed at the margin and apex. The sori are abundant, and form a line near the midrib, and are more or less continued up the larger lobes. The plant is by no means uncommon, and is widely distributed. We have specimens from—Cornwall : Penryn, *G. Dawson.* Devonshire : Marwood, *Rev. F. Mules;* Bittadon, *F. M.* Somersetshire : Nettlecombe, *C. Elworthy.* Surrey : Mayford, *T. M.* Worcestershire : Daylesford, *H. Buckley.* Herefordshire, *G. Dale.* Pembrokeshire : Castle Malgwyn, *W. Hutchison.* Edinburghshire : Pentland Hills. Donegal : Killybegs, *R. Barrington.* Mayo : Westport, *R. B.;* Ballycroy, *R. B.* Wicklow : Glencullen, *R. B.;* Glen of the Downs, *R. B.* Dublin : Three-rock mountain, *R. B.;* Glen near Kingstown, *R. B.;* Glendruid, *R. B.* Kerry : Killarney, *N. B. Ward.* [Plate LVI.]

19. *decompositum* (M.). This may be considered as a super-elegant form of *incisum,* in which the fronds are quite tripinnate. The pinnules are divided quite down to the midrib at the base, and the short oblong blunt secondary pinnules thus formed, are toothed along their sides, or sometimes pinnatifid with toothed lobes. It is this greater amount of division, the complete separation of the secondary pinnules, which distinguishes this form from *incisum.* It is certainly, with one exception, the most beautiful among the normal forms which the Lady Fern assumes. We have seen this form from—Cornwall : Penryn, *G. Dawson.* Somersetshire : Nettlecombe, *C. Elworthy.* Kent : Chislehurst. *G. B. Wollaston.* Hampshire : Basingstoke, *F. Y. Brocas.* Worcestershire : Daylesford, *H. Buckley.* Denbighshire : Ruthin, *T. Pritchard.* Clare : Lisdoonvarna, *R. Barrington.* [Plate LVI, left hand figure].

20. *plumosum* (M.). This is the most remarkable and beautiful form of hardy fern that has been discovered in the British Isles—beautiful on account of the singular lightness and elegance of its

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form and cutting, and remarkable in an equal degree on account of the very peculiar nature of the fructification. The fronds are about two feet and a half in height, and ten inches or upwards in breadth, the stipes occupying about the usual proportion of the height; the outline is hence very broadly lanceolate, and the division is distinctly tripinnate. The pinnæ at the centre of the frond in the largest fronds we have seen, are about five and a half inches long, and two and a half inches in breadth, so that the longer pinnules measure fully an inch and a quarter; they are nearly parallel-sided, and end in a shortish acuminate point; and they are rather distant below, approximate or sometimes crowded above. The pinnules are ovate acuminate, overlapping, divided down to the slender margined costa, into distinct sometimes distant secondary pinnules, which are linear, half an inch long, inciso-pinnatifid, with narrow linear segments, of which the lowermost are unequally bifid or three-cleft with linear acute teeth. These ultimate divisions are so narrow and so numerous, that the fronds are especially remarkable for the plumy lightness and elegance of their character. The sori are very imperfect, consisting of but few spore-cases, which are almost if not quite without indusia! they are situated just at the sinuses of the narrow secondary pinnules at their anterior base, and at the tip of the basal anterior veinlets, which seem to be there nearly excurrent, so that the sori are almost davallioid; the teeth are sometimes incurved towards the sori. We have here and there traced an indistinct membrane in connection with the spore-cases, but nowhere a perfectly formed characteristic indusium. The abnormal development of the fructiferous organs, evidenced alike by the paucity of spore-cases and the want of indusium, is, no doubt, as in numerous other well-known cases, to be referred to the peculiar and excessive development and division of the leafy organs. The spore-cases are, nevertheless, not abortive, however abnormal the condition of the sori may be, as we learn that young plants have been raised, quite true to their peculiar character, from the spores of the parent plant. It was found by Mr. J. Horsfall, near Skipworth in Yorkshire, in the autumn of 1857, and is in the possession of Messrs. Stansfield of Todmorden, to whom we are indebted for specimens. [Plate LII B; LVI, *bis.*]

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21. *laxum* (Schum.). This is a large-growing, broad, much-divided form, having some resemblance to *incisum*, but in well developed states it is more lax in habit. Its most obvious distinguishing peculiarity consists in the very marked elongation of the anterior basal lobe of the long narrow pinnules, these lobes forming a line on each side the midrib. In other respects, the description of *incisum* would apply to *laxum*. The pinnules are, however, sometimes distant, in which state it approaches *rhæticum*. This form, which accords with Schumacher's description of his *Athyrium laxum*, first attracted our notice in specimens from the neighbourhood of Shrewsbury, in the collection of the Rev. W. A. Leighton, and we have since received it from many localities in the three kingdoms, so that it does not appear to be an accidental condition, but a variety of distinct and permanent character. The prolongation of the anterior lobe into a kind of auricle, indicates an approach towards *rhæticum*, in which there is the same kind of elongation, but our specimens are much broader and more lax than the latter plant. We may add that in all the compound forms of Lady Fern the anterior basal lobes are longer than the rest; but what occurs in this variety is an exaggerated and more manifest elongation. It has been found in—Devonshire: Parracombe (pinnules distant), *Rev. J. M. Chanter*. Somersetshire: Nettlecombe, *C. Elworthy*. Kent: Tunbridge Wells, *Mrs. Delves*. Surrey: Mayford, *T. M.* Gloucestershire: Avening, *Mrs. Campbell*. Shropshire: Shrewsbury, *Rev. W. A. Leighton*. Yorkshire, *A. Clapham*. Pembrokeshire: Castle Malgwyn, *W. Hutchison*. Denbighshire: Ruthin, *T. Pritchard*. Perthshire: Pass of the Trosachs, *T. M.*; Callender, *T. M.* Argyleshire: Ardrishiag, *T. M.* Donegal: Killybegs, *R. Barrington*; Gweedore, *R. B.* Sligo: Lough Gill, *R. B.* Galway: Kylemore; Glendalough; Connemara, *R. B.* Mayo: Slieve More, island of Achil, *R. B.* Wicklow: Valley of the Dargle, *R. B.* Jersey, *J. James*. Guernsey (long toothed), *C. Jackson*. [Plate LVII B.]

22. *pyramidale* (M.). A form allied to *laxum*, having rather broader pinnules, fully an inch long, and tapering in a pyramidal manner to an acute point; the lobes are deeply separated, and their teeth have an incurving tendency. In the size of the pinnules and their acute apices, this form shows a tendency towards *plumosum*, but the parts

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are not so elegantly divided. It has been gathered in Devonshire by the Rev. J. M. Chanter; and at Tunbridge Wells by Mrs. Delves.

23. *undulatum* (M.). A large form, with broad fronds, and of the *incisum* type. The fronds, exclusive of the stipites, which as well as the rachides are red, are a foot and a half long, and about nine inches broad; the pinnæ are crowded, broadish (1½ inch) irregular, and acuminately pointed. The pinnules are lanceolate acute, rather irregular, stalked, deeply pinnatifid, almost pinnate, crowded, and with a reflexed tendency. The edges of the lobes are somewhat wavy, which gives a minutely crispy appearance to the fronds. It was found in Guernsey by Mr. J. James of Vauvert.

24. *validum* (M.). A dwarfish but stout-growing variety, with much of the character of *laxum*. The rachis, which with the stipes is reddish, is particularly broad and thick, and is flexuose in the upper part. The pinnæ are crowded, and acuminate; the pinnules also crowded, the lobes more or less incurved in the way of *rhæticum*, and deeply pinnatifid, the secondary rachides slender. It was found at Dolgelly, in Wales, by the Rev. J. M. Chanter.

25. *rhæticum* (Lin.). This variety is generally distinguishable by its narrow erect fronds, and its distinct and apparently linear pinnules, which however owe their narrowed appearance to the inflection of the points of their lobes over the sori. The anterior basal pinnules are also conspicuously longer than the rest, as are the anterior basal lobes of all the pinnules. The caudex grows in tufts, and produces numerous fronds, which stand upright, and though herbaceous, have a rigid appearance, owing probably to the circumstance of their growing exposed, as is generally the case with this variety. The same cause, namely, exposure, often produces more or less of convexity in the pinnæ. It occurs with the stipites either pale green, or purplish red. The fronds grow from two to four feet high, with a narrow lanceolate outline. The pinnæ are distant, the lower ones most so, and these are also usually deflexed, though the majority have an upward or ascending tendency. The secondary rachides are slender, and without any herbaceous wing, the pinnules being set on distinct from each other, and very commonly at a right angle with them; these pinnules are narrow, linear-lanceolate, becoming

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apparently linear, with the enlarged or prolonged anterior basal lobe quite evident. This narrowed appearance results from the incurving of the points of the lobes into which the margin is divided, whence the pinnules become convex. The lobes are toothed. The sori are developed at the base of the lobes on the anterior sides of the venules, extending in two lines up the larger lobes; the lobes are, however, so narrow, that they are necessarily very near together from the first, and become confluent as soon as the spore-cases begin to spread. This form or variety is no doubt general, as it is known to occur in various places all over England, in North Wales, in both the Lowlands and Highlands of Scotland, and in the four provinces of Ireland. It grows in exposed boggy places, and two or three states of it occur; one of these, which Mr. D. Moore informs us is not uncommon in Ireland, has shorter but equally distinct pinnules, and the same erect habit. *Aspidium irriguum* is no doubt a small state of the green form of this variety, and is perhaps permanently smaller. [Plate LVII A.—Folio ed. t. XXXI A.]

The following habitats of the erect Lady Fern are known :—

Peninsula.—Cornwall: Travenna. Devonshire: Barnstaple, *Rev. F. Mules.*

Channel.—Sussex: Tunbridge Wells, *Miss Bower.*

Thames.—Surrey: Virginia Water, *T. M.;* Shirley, *W. Taylor;* Mayford, *T. M.*

Ouse.—Norfolk: Loddon, *Rev. J. J. Smith.*

Severn.—Warwickshire: Arbury Park, *T. Kirk.* Worcestershire: Daylesford, *H. Buckley.* Gloucestershire: Nailsworth, *Mrs. Campbell.* Herefordshire: Penyard Park Wood, near Ross, *W. H. Purchas.* Shropshire: Shrewsbury.

Mersey.—Lancashire: Accrington.

Humber.—Yorkshire: Mickley Barrows; Crayke, *G. J. Chester.*

S. Wales.—Pembrokeshire: Castle Malgwyn, *W. Hutchison.*

N. Wales.—Denbighshire: Ruthin, *T. Pritchard.* Carnarvonshire: Aber.

E. Lowlands.—Roxburghshire.

E. Highlands.—Perthshire: Dunkeld, *A. Tait;* Callender, *T. M.;* near Dalnacardoch, *Dr. Graham.*

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W. Highlands.—Inverness-shire: Ben Nevis, *S. F. Gray;* Argyleshire: Lochgoilhead, *T. M.* Isle of Arran.

Ulster.—Antrim: Cushendall, *D. Moore.* Donegal: Gweedore; Killybegs, *R. Barrington.*

Connaught.—Galway: Kylemore, *R. Barrington;* Moycullen, *R. B.*

Leinster.—Wicklow: Glen Cullen, *R. Barrington.* Dublin: Scalp, *R. Barrington;* Three-rock Mountain, *R. B.*

Munster.—Kerry: Mucruss; Killarney, *D. Moore.*

Channel Isles.—Guernsey, *C. Jackson.*

To this species, certainly, and probably to the variety *rhæticum*, belongs a plant "gathered on ye mountains of Mourne, in ye county of Down," by Sherard, and now preserved in the University Herbarium, Oxford. It is the *Asplenium Adiantum-nigrum*, β. of Sir J. E. Smith, and is referred to *Asplenium acutum* by Mr. Newman. Sir J. E. Smith correctly describes it as of a delicate membranous texture, the leaflets finely laciniate and without fructification. We are indebted to Mr. Masters for a photograph of Sherard's plant, which leaves no room for doubt that it is an *Athyrium.* It is assuredly not at all like *Asplenium Adiantum-nigrum*, or *Asplenium acutum.* The frond is about a foot long, linear-lanceolate, bipinnate, with narrow oblong pinnæ, of which it would appear that the veins are more perfectly developed than the parenchyma, hence the appearance of being palmately laciniate. It is just such a state as might be expected to be produced in a dark cave, in which this is said to have grown.

26. *flexuosum* (M.). This variety resembles *rhæticum* in its upright growth, its distant ascending pinnæ, and its distant narrow convex pinnules with incurving lobes; but is peculiar in the very strongly marked flexuose character exhibited by the main rachides, and not unfrequently by the stipites also; they are sometimes so much twisted as to become perfectly grotesque. It was found at Windermere in Westmoreland by Mr. J. Huddart, and is cultivated by Mr. Wollaston.

27. *gracile* (M.). A slender lax and very graceful dwarfish variety, of drooping habit. The fronds, excluding the stipites, are about a foot long, and six inches broad, lanceolate in outline. The

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pinnæ are distant, rather narrowed towards the base, and caudately acuminate. The pinnules are separated by a space equal to their own width or more on the very slender secondary rachides, and are linear-oblong, the larger and more perfect ones near the middle of the pinnæ fringed in the upper half with numerous linear acute teeth; scarcely pinnatifid in the lower portion. It is a very graceful variety, and was accidentally observed among plants of the Lady Fern in a suburban nursery, whence it passed into the hands of Messrs. Parker and Williams, of Holloway. The acuminate points of the pinnæ, and the linear teeth of the pinnules are still more evident in fronds from well established plants, than in that from which our figure was taken. [Plate LVIII.]

28. *dissectum* (Woll.). This, and the four following varieties, though symmetrical in outline, have something of an abnormal character in the irregular development of their pinnules. The present is a stout-growing dwarfish variety, the fronds scarcely exceeding a foot in height, seven inches in width, very broadly oval, and irregular in appearance. The pinnæ are somewhat unequal in length, but not sufficiently so to affect the general outline, approximate or crowded, broadish to near the end, and then suddenly acuminate. The pinnules are rather distant, decurrent, unequal in size, and irregular in form, but for the most part ovate-oblong, blunt, and cut into distant unequally-toothed lobes, separated by wide open sinuses. Mr. Wollaston considers it to "bear some analogy to *præmorsum*, being irregularly jagged both in the pinnæ and pinnules, but it is of the usual size, and fertile." It is lax and elegant in habit; the pinnules decurrent and deeply and irregularly incised. It was found by Dr. Young in Ireland, and is rare and constant in cultivation. [Plate LX C; LX, *bis.*—Folio ed. t. XXXIV C.]

29. *diffissum* (M.). This variety is somewhat similar to *dissectum*, the pinnules being cut in the same open irregular way. The fronds are about a foot and a half high, and usually broad lanceolate; the pinnæ being distinct or approximate, and tapering rather gradually to a narrow point. The pinnules are approximate but scarcely crowded, irregular in size and form, but usually oblong or ovate-oblong, deeply pinnatifid with unequally-toothed lobes, separated by an open sinus. It is a very elegant form, somewhat intermediate

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in character between *laciniatum* and *dissectum*, though most resembling the latter. The plant above described was found in Guernsey, by Mr. James: but we have seen others sufficiently near to be associated with it, from—Lancashire: Todmorden, *A. Stansfield.* Dumbartonshire: Tarbet, *T. M.* Isle of Man, *Dr. Allchin.*

An elegant slender form (*diffissum gracile*), of the same general character as the foregoing, has been sent from the Sulphur Wells, Harrogate, by Mr. Clapham.

30. *decurrens* (M.). This form grows from a foot to a foot and a half high, and is lanceolate in outline. The pinnæ are somewhat narrowed towards the apex, which however terminates irregularly and abruptly, as if the extreme point had been eaten off. The pinnules are distant, sessile and decurrent, linear-oblong, pinnatifid, with unequal spreading but not very prominent teeth. In short, being much disfigured, the fronds have the appearance of having been nibbled all over. It was found near Conistone, in the Lake district, by Mr. Wollaston.

31. *pannosum* (M.). A moderate-sized and rather slender variety, the fronds lanceolate, and the pinnæ irregular in outline, and tapered to a point. The pinnules are irregularly pyramidal, more or less decurrent, deeply pinnatifid, the lobes unequal-sized and disproportioned, notched with variously-shaped teeth. It has been sent to us from—Somersetshire: Nettlecombe, *C. Elworthy.* Suffolk: Lowestoft, *Mrs. Walker.* Yorkshire: Whitby, *W. Willison;* Hovingham, *C. Monkman.* Lancashire: Todmorden, *A. Stansfield.* We also refer here specimens found at Virginia Water, in Surrey, by Dr. Allchin.

32. *varians* (M.). A very remarkable, and, in its best state, a very handsome form. It is a large-growing plant of the *incisum* type, the fronds two feet or more in height, and eight or nine inches broad, variable in character. In the most remarkable ones, which are quite tripinnate, the pinnæ are broad, often two and a quarter inches wide at the base, oblong-ovate, tapered suddenly to an acuminate serrated point. The pinnules are distinct, the largest an inch and a half long, ovate-oblong acuminate, the rest somewhat narrower but also acuminate—this attenuation or acumination of the points of the pinnules giving a remarkably distinct character to

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the frond; they are deeply pinnatifid generally, the basal ones quite pinnate, the divisions being distant, narrow and taper-pointed, the larger ones toothed at the sides. The sori are everywhere copious. Other fronds are produced, in which the attenuation of the parts is less manifest, the pinnules being pyramidal acute, nearly three-fourths of an inch long, deeply pinnatifid, with an enlarged anterior basal lobe, the lobes narrow and acutely-toothed, but not taper-pointed. In the deep cutting of the pinnules and the enlarged anterior basal lobes these fronds resemble *laxum*. The plant was raised as an accidental seedling, in the garden of Mr. J. H. Sclater, of Newick Park, near Uckfield, Sussex.

Abnormal and Multifid Series.

33. *præmorsum* (M.). This curious dwarf and as yet barren form was found by Dr. Dickie on Ben-Mac-d'hui, at an altitude of 3700 feet, in 1846, and has since that time proved constant under cultivation. The fronds, which rarely attain a height of eight inches, are of an irregular lanceolate outline. The pinnæ are very unequal and blunt, scarcely pinnate. The pinnules or lobes are oblong or roundish, decurrent or confluent, unequal in size, and often irregularly lacerate as if they had been partially eaten by an insect. It is exceedingly rare, but has no other interest, being exceedingly ugly. This form may possibly be found to belong to *Polypodium alpestre*, when its fructification is ascertained.

34. *irregulare* (M.). A curious variety, remarkable for the irregular nature of its development. The pinnæ are distant, furnished in their upper half with linear-lanceolate acute incised normal-looking pinnules three-fourths of an inch long, those on the lower half (except sometimes the basal anterior one, which is long and narrow), very much though irregularly shortened, frequently roundish or fan-shaped and pinnatifid, with serrated lobes; sometimes intermixed with these shortened pinnules are other longer ones, approaching the normal character. It was found in 1854 in Belvoir Woods, Rutlandshire, by Mrs. Rogers. Similar plants have been met with by Dr. Allchin at Virginia Water, Surrey, in Black Park, Buckinghamshire, and in the Isle of Man; and we have received the same variety slightly modified in form from Mr. A. Clapham, by

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whom it has been found at Harrogate in Yorkshire; and from Messrs. Stansfield of Todmorden, found in Sussex by Mr. S. Nowell. [Plate LX B.]

35. *laciniatum* (M.). A very pretty small form, which hardly admits of description, on account of the variableness of its character, and the many modifications under which it is met with. The typal and more characteristic plants have the general lanceolate outline of the frond broken up by the irregular abbreviation of some of the pinnæ; some are quite short, others are caudate or acuminate in the ordinary way, while others again are præmorse, the outline of the frond thus becoming very irregular. The pinnules are decurrent, very variable in size and form, and very irregularly and usually deeply laciniated. The sori are numerous, and crowded about the base of the laciniate lobes. Occasionally the fronds are much more depauperated, scarcely any of the pinnæ being developed beyond the size of an ordinary pinnule, and these flabellate or truncate or lobate or even palmate, all intermixed; while in some other instances, the pinnules are nearly all depauperated, and replaced by a long linear laciniate-toothed pinna. Sometimes a few nearly or quite round pinnules are produced; and the plants are liable, especially if freely grown, to produce fronds in which the parts revert in some measure to a normal character. This variety was first described from fronds sent from Nettlecombe in Somersetshire by Mr. Elworthy. Another excellent form, for which the name *decompositum* had been suggested, has been sent by Mr. A. Clapham; this was found near Thirsk, Yorkshire, by Mr. R. Foxton. We have other forms of the same general character, but not quite identical, from—Westmoreland: Windermere, *G. B. Wollaston.* Yorkshire: Harrogate, *A. Clapham.* Lancashire: Todmorden, *A. Stansfield;* Prescott, *R. Morris.* Somersetshire: Nettlecombe, *C. Elworthy.* Sussex: Balcombe, *G. Hankey.* Edinburgh, *A. Tait.* Others again, rather less marked, are from—Yorkshire: Scarborough, *A. Clapham.* North of Ireland, *A. Stansfield.* [Plate LIX A.]

There are some additional forms related to *laciniatum*, that may be conveniently ranked as subvarieties. The most important are—

— *laciniatum majus* (M.). A larger plant than *laciniatum*, but very similarly depauperated in the upper half, the lower half being

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more normal. The fronds are very broad and about two feet high. This form, which somewhat approaches *irregulare*, was found at Tunbridge Wells by Mrs. Delves. [Plate LIX B.]

— *laciniatum minus* (M.). A dwarf form, six to eight inches high, irregular in development like *laciniatum* itself, the parts deeply laciniate-toothed. It has been found at Ilfracombe, in Devonshire, and communicated by Mr. C. Jackson.

— *laciniatum dissectum* (M.). A very beautiful dwarf form, moderately irregular in the outline of the frond, and considerably so in the outline of the pinnæ; the pinnules are, however, rather less abbreviated, and rather more regularly and distinctly laciniate-toothed, the teeth being long narrow and prominent. This very elegant form, which is toothed like *odontomanes* (12), was found in Newton Dale, near Whitby, Yorkshire, by Mr. Clapham.

36. *exile* (M.). A dwarfish slender form, with narrow irregular long-pointed pinnæ, and unequal-sized narrow or linear-oblong pinnules, which are deeply pinnatifid, the lobes here and there enlarged, producing ramose pinnules; the lobes have short bluntish teeth. The fronds are much more slender than in *dissectum* or *diffissum*, and less depauperate than in *laciniatum*. It was found by Mr. Stansfield, of Todmorden; and a somewhat similar form, also found by Mr. Stansfield, comes from Antrim, in Ireland.

37. *erosum* (Woll.). This form is of medium size, the fronds lanceolate, and nearly normal in outline, the pinnæ being of the usual size. The pinnules, where most normal, are blunt, oblong, pinnatifid, and decurrent, the lobes unequal with short bluntish teeth; they are, however, frequently variously depauperated, so as to become unequal in size, and the lobes being sometimes disproportionately developed, the fronds have an irregularly laciniated appearance; the pinnules are sometimes even bifid or multifid. It was found in Kent, near Tunbridge Wells, by Mr. Wollaston; and similar forms have been found in—Devonshire: Marwood, *Rev. F. Mules;* Kerry: on Cahir Conree, near Tralee, *Dr. Allchin.* Another plant, somewhat more regular and normal-looking, with a tendency to dilatation at the points of the pinnules, was gathered by Dr. Allchin in the Isle of Man. The following, also, is closely allied to this variety, but is a plant of smaller growth:—

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— *erosum minus* (M.). A small elegant form, of the same general features as *erosum*. The fronds are narrow, a foot high, irregular, the pinnæ tapered but not acuminate, the pinnules unequal and irregular, and when here and there nearly normal, small, oblong, and pinnatifid. It was found near Windermere, by Mr. F. Clowes.

38. *abruptum* (M.). A singular monstrosity, with somewhat the aspect of *marinum*, but having the fronds variable in form. Those of them which are most marked, have the pinnæ crowded, partially depauperated, roundish, or oblong, and unequally cut into coarse lobes or teeth; the few pinnules here and there, which bear something like a normal character being bluntly oblong, with broad shallow-toothed lobes. At the apices of most of the pinnæ there are one or two larger pinnules, but the normal gradually tapering apex is wanting, and this, together with the dilatation of the apex of the fronds, gives the latter an appearance of peculiar abruptness. Sometimes the frond is narrower, with the apex lengthened out, and here and there the pinnæ are terminated by a somewhat elongated pinnule set endwise, the rest terminating abruptly. Occasionally a normal frond is produced, which may be compared to those of *molle*, but with the pinnules narrower and more deeply lobed, and the lobes smaller and more finely notched. This was found by Dr. Allchin at Port Erin, in the Isle of Man.

39. *tortile* (M.). This is another of the curious forms in which, while the general outline of the frond is preserved, the pinnules are so varied or distorted as to produce an appearance of great irregularity. The pinnæ are rather unequal in length, and their points are frequently curved or twisted, which, together with the various directions taken by the pinnules on account of their irregular development, has suggested the name. The pinnules are rather distant, here and there oblong and pinnatifid, but with unequal lobes, but the majority are either shortened by an arrest of development, or narrowed by the abortion of the lobes, or curved by the unequal growth of the two sides, or otherwise variously and irregularly distorted. It is altogether a very odd-looking curious variety, and quite constant. The plant was found at Skipworth, in Yorkshire, by Mr. Stansfield.

40. *interruptum* (Woll.). This is a curious form with abbreviated pinnæ. The fronds are dwarfish, and sometimes branch

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near the summit, becoming bi- or tri-furcate. The pinnæ vary very much in form, and they are also remarkably variable in length and in the mode of division; their apices are almost always divided, sometimes simply, or sometimes in a multifid manner, so that they may be said to be ramose. The pinnules are very unequal in size, and in the number and form of their lobes, which are again variously toothed, the serratures being often deep and acute. There are two slight modifications of this variety; one raised from seed by Mr. J. Young, of Taunton, Somerset, and the other found in a batch of seedling plants at Ambleside, Westmoreland, by Mr. Wollaston. Both are rare and curious. [Plate LX A.]

41. *nudatum* (M.). A dwarf red-stiped variety, of very curious growth. The pinnæ are of variable length, the upper ones being longest, so that the apex of the frond is abrupt. The frond is also narrow from the abrupt shortening of most of the pinnæ; but the most remarkable peculiarity is that along the centre of the pinnæ there is a bare space of about half an inch on the rachis devoid of pinnules, so that the upper ends of the pinnæ appear stipitate, or as if they were the result of a second growth. The lower pinnules are crowded, broad or ovate, obtuse, rather irregular, deeply pinnatifid, the lobes with unequal longish teeth. The apical series of pinnules are narrower and of a more regular normal character; these apical portions are, however, occasionally branched or forked. It has been sent from Devonshire, by Mr. C. Jackson, and requires proving.

42. *capitatum* (M.). A medium-sized form, about a foot and a half high, and six inches broad, the pinnæ rather distant, broadest at the base, tapering though a little irregular towards the apex, just below which they are much narrowed. At the apex of the pinnæ three or four full-sized pinnules are produced, forming a terminal head or tuft. The pinnules are oblong, blunt or almost squared, deeply pinnatifid with divergent-toothed lobes along the sides, and laciniate-toothed at the apex. The upper part of the frond is more irregular and very much laciniated. The stipites and rachides are red. It was found at Ilfracombe by Mr. C. Jackson.

43. *laceratum* (M.). A narrow and very much lacerated variety, growing about a foot and a half high. The pinnæ are short, very irregular, and generally abrupt, with a tendency to become branched

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at their apex. The pinnules, in some parts wanting, and here and there unusually enlarged, are mostly irregularly oblong or ovate, deeply pinnatifid or ramose, the alternate teeth being narrow and spreading, and producing a fimbriate appearance. It is of the same general character as *laciniatum*, but yet different from the forms of that variety, and apparently an abnormal variation of the red-stiped *rhæticum* group. It was found in Devonshire by Mr. C. Jackson.

44. *diversifrons* (M.). This plant produces fronds of two forms. A portion of them are much like those of *incisum*, from which doubtless the variety has originated; while others are singularly depauperately laciniated. The fronds are broad. The pinnæ are various in length and outline; some linear tapering to a point; some abbreviated and forked or hooked at the extremity, the whole rachis occupied by the pinnules, or considerable spaces on one or both sides quite bare. The pinnules are everywhere irregularly pinnatifid, and laciniated, sometimes depauperated either in length or breadth. It was raised from spores some years since by Mr. Young of Taunton.

45. *colpodes* (M.). An interesting form, growing about a foot and a half high and five inches broad. The fronds are lanceolate, and tolerably symmetrical. The pinnæ are broad, *i. e.*, ovate-lanceolate acute or sometimes acuminate, and here and there branched towards the end, rather distantly placed on the rachis. The pinnules are distinct ovate-oblong, deeply pinnatifid, the lobes curving towards the apex of the pinnule, and forming a rounded or very open sinus, which is the conspicuous feature of this variety; the lobes are acutely toothed. It has been found by Mr. Wollaston.

46. *caudiculatum* (M.). A very odd-looking and remarkable form, growing from a foot to a foot and a half in height, with narrow erect fronds rather bare of pinnæ below, and having a generally interrupted character. The pinnæ are usually distant below, and sometimes opposite, sometimes alternate, while above they are often crowded; they are sometimes wanting, sometimes short, an inch or so in length, while the adjoining one may be two inches long; they are rarely simple, usually branched near the base, or multifidly branched and dilated at the apex, spreading ascending or incurved; they are, however, all or nearly all caudate at the points, and the multiplicity of tail-like projecting segments resulting from the frequent

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division of the pinnæ at their apices is one of the chief characteristics of the plant. The more normal pinnules are mostly ovate, various in size, and very unevenly pinnatifid, the lobes being toothed. The multifid apices of the pinnæ are remarkable for the crowded mass of caudate segments, and for the flattened or fasciated rachis, all distinction between pinnules and segments being lost. The frond terminates in a compact multifid mass, and this together with the crowded masses which terminate the pinnæ must have a crispy character when growing. It was found at Chambercombe, in Devonshire, by the Rev. J. M. Chanter.

47. *polyclados* (M.). This form of variation includes several large much-divided ramose plants, which are undescribable in general terms, no two fronds being alike in their divisions. In some examples, the frond is three-branched at the top of a long stipes; the branches being bipinnate and dichotomous at the end; the pinnæ unequal, sometimes bifid; the pinnules also unequal in size, and irregular in shape and division. The pinnæ are in some fronds excessively developed, and become branch-like about the middle of the frond, while those at the base, as well as the apex of the frond itself appear as if arrested; the pinnules on these larger pinnæ are often an inch and a half long, pinnately divided, the secondary pinnules pinnatifid with inciso-laciniate lobes. Sometimes the branched rachis is the only peculiarity, the branches whatever their number being nearly or quite normal. In some fronds the peculiarity consists in the apex being formed of three or four normal looking but considerably enlarged pinnæ; or with a nearly normal outline, the pinnæ may be very unequal in size, having the pinnules here crowded, there distant, and the apex caudate or sometimes forked. Very marked forms having the above peculiarities have been found in Devonshire, near Ilfracombe, by the Rev. J. M. Chanter, and in Guernsey by Mr. C. Jackson; and we have others agreeing generally with them, from—Lancashire: Eccleston, *R. Morris;* Manchester, *J. Horsfall,* communicated by Messrs. Stansfield. Devonshire: Barnstaple, *C. Jackson.* Westmoreland: Windermere, *F. Clowes.* Some other branched forms may be conveniently included as subvarieties—

—*polyclados minus* (M.). This has been found near Scarborough, Yorkshire, by Mr. Clapham. It is ramose both in the stipites and

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rachides, and has small blunt oblong pinnules, which are pinnatifid and toothed in the normal manner.

—*polyclados dissectum* (M.). This has the fronds generally ramose; the stipites and rachides red; the pinnæ sometimes forked at the tips; the pinnules sessile or decurrent, pinnatifid; and the lobes furnished with deep irregular linear acute teeth. It has been found in Trentham Park, Staffordshire, by Mr. S. Jervis.

—*polyclados irregulare* (M.). This has the fronds frequently branched, and also more or less multifid at the apex; the apices of the irregular confused-looking pinnæ are also often forked. The pinnules are irregular in size and form, sometimes ovate and deeply pinnatifid, sometimes linear with shallow lobes, and sometimes distorted or abbreviated; the teeth are short, acute, and not prominent. This form has been found by Mr. Wollaston, in Pett's Wood, near Chislehurst, Kent, and at Hulm, near Windermere, Westmoreland.

48. *ramosum* (Woll.). This like the variety *pruinosum*, is densely covered with glands, so that the stipites carry a bloom like that of the plum—a peculiarity which is unusual in this species. The fronds are frequently branched, the ramifications being very unequal. The pinnæ are extremely variable in form and length, so that while those on one division or branch of the frond may be normal, those on another may be altogether abnormal, some being long, some short, and some wanting altogether. Those which are present, are variously interrupted or depauperated, so as to be very irregular in form, a portion of the pinnules being normal and full-sized, others variously abbreviated and inciso-laciniate, and others again shapeless or abortive, or often altogether wanting. The pinnules have the same kind of unsymmetrical development, the lobes being either one, two, or three-cleft on the same pinnule. The normal pinnules are oblong acute, and slightly falcate. The plant is sparingly fertile, and permanent under cultivation. It was found by Mr. W. W. Reeves, near Tunbridge Wells, Kent, and we are indebted to Mr. Wollaston for specimens.

49. *ramulosum* (M.). There are many forms to be referred to this variety, which is analogous to that called *multifidum* under some of our British species. Its characteristic is the production of a tuft of short branches at the apex of the fronds, the rachis merely dividing

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near the upper end, and producing little flat branchlets. The fronds of some of the best forms of this variety are from two to three feet high, and nine inches or more in breadth, the pinnæ long and tapering, the pinnules oblong acutish and more or less distinct, and the apex of the frond dividing into five or six pointed divisions. A plant of this character, quite constant, has been found at Windermere, by Mr. F. Clowes; and this we take as the type of the group. In some instances varieties having the ramose apex have not proved constant. We have other specimens agreeing with the above description from Hovingham, Yorkshire, found by Mr. C. Monkman.

50. *furcatum* (M.). This is a monstrous form of the *molle* type. The ends of its pinnæ are forked, usually once, sometimes twice or more, with a tendency to dilatation in the tips; and the apex of the frond is divided into a small short tassel. It was found near Ilfracombe, by the Rev. J. M. Chanter; and is, we learn, constant.

51. *furcans* (M.). This variety grows upwards of a foot and a half in height, and is lanceolate, with the pinnæ distant below, and approximate above. When in a characteristic state, the ends of the pinnæ are divided into two or three flat tapering diverging points, which are rarely again divided. The pinnules when perfect are pyramidal, and deeply pinnatifid with oblong blunt toothed lobes, but they are frequently more or less abbreviated and præmorse at the tips, and not uncommonly shortly bifid or dilated there. The fronds seem to have a tendency to become irregular and depauperate in development. This variety was found near Harrogate, Yorkshire, by Mr. A. Clapham, and has hardly been as yet sufficiently tested.

52. *furcillatum* (M.). A lax and elegant multifid form, the fronds of which are about a foot long exclusive of the stipites, and nearly six inches broad, with slender rachides. The pinnæ are rather distant, narrowish, and tapering to a long slender caudate point, the end of which is split into a somewhat spreading fork of two slender branches, which are flat and either toothed or again forked, and sometimes divided into a tuft of short segments. The apex of the frond is also slender, and divided twice or thrice into narrow forking segments. The pinnules are distant, sessile and decurrent, oblong acutish, and pinnatifid or inciso-dentate above, narrowing below into the decurrent portion which is entire. The lax habit, and slender

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narrow terminal forks are the peculiarities of this variety, which was found at Nettlecombe, in Somersetshire, by Mr. Elworthy.

53. *polydactylon* (M.). This is a monstrous form of the *incisum* type, very elegant and ornamental in character. Its peculiarity consists in the apices of the pinnæ being furcately divided into about five or six normal-looking, *i. e.*, not crisped, points; or, in other words, the multifid apices of the pinnæ are plane, and bi-tri-furcate. The apex of the frond is also several times forked. The fronds are vigorous, a foot and a half or more in height, lanceolate, symmetrical, with the pinnæ distant below. The pinnæ are oblong, not much narrowed below the forked apex, which is normal except in this, that it is twice or rarely three times divided in a dichotomous manner, so as to form a three to five fingered termination to each pinna. The pinnules are oblong-lanceolate, and pinnatifid, in the way usual amongst the larger normal forms of the species. It was found near Nettlecombe, in Somersetshire, by Mr. C. Elworthy, who has found the fronds of this variety to perish six weeks earlier than those of the somewhat similar variety *multifidum*. Similar forms have been found in— Devonshire: Barnstaple, *C. Jackson*. Kent: Tunbridge Wells, *Mrs. Delves*. Yorkshire: Whitby, *W. Willison*. Westmoreland: Windermere, *F. Clowes*. [Plate LXIV B.]

54. *multifurcatum* (M.). A fine vigorous multifid variety of the *incisum* or *laxum* group. The plant may be described as resembling *incisum*, except in this, that the ends of the pinnæ are multifid in a peculiar way, and the apex of the frond is also multifid, forming a short terminal spreading tuft which merges into those of the pinnæ. The pinnæ are somewhat narrowed towards their multifid apex, which is spread out into a flat series of divergent almost recurving segments, growing out into longish points, much in the same way as occurs in the tufts formed by *Blechnum Spicant*, v. *multifurcatum* (Plate XCVII), only on a smaller scale. This, which appears to be a very distinct and handsome form, has been sent to us from Voil Famma, a mountain in the neighbourhood of Ruthin, Denbighshire, by Mr. T. Pritchard.

55. *multifidum* (M.). This, though a monstrous form, is one of the most beautifully symmetrical and graceful permanent varieties of British Ferns which have yet been found, exactly analogous in

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character with the cristate variety of the Male Fern. The fronds are broad-lanceolate two to three feet high, and nine or ten inches broad, rather lax, and in habit corresponding generally with the usual forms of the species ; from which however, it differs in having the apices of the frond, pinnæ, and (in well-grown plants) the pinnules most elegantly tasselled or divided into a lash of dichotomously branched narrow segments. The tips of the pinnæ are therefore many times dichotomous, with the apices of the segments dilated and incised. The pinnules are distinct oblong acute subfalcate, pinnatifid, the points of the lobes becoming usually more or less incurved, as in *rhæticum*, to which group this form evidently belongs. This incurving is the only defect of the plant as regards its beauty, but it frequently produces a crumpled or curled appearance; the plant is, nevertheless, very handsome. Mr. Wollaston has suggested, with a view to the use of uniform names for the corresponding varieties of all the species of Ferns, that this ought to be called *cristatum*, on account of its being the analogue of the crested form of the Male Fern ; but, however desirable, it seems impossible, without continually having to change the names in use, to arrive with exactness at this uniformity, so that Fern-cultivators must adopt the rule which botanists have established on this point, and avoid mere change, which is a greater evil than that which it would seek to remedy. Our plate of this variety necessarily represents a small specimen; when large and at the same time well grown, it is far handsomer. This form was, we believe, first found near Seven Churches, Wicklow, Ireland, by Mr. D. Moore; and similar forms are reported to have been found in Clare, by Dr. Kinahan; in Killarney, by Mr. Ogilby ; in the Lake district of Westmoreland—a fine form, now in the possession of Mr. Wollaston ; and at the foot of Ben Lawers in Scotland, by Mr. W. Marshall of York. [Plate LXI.—Folio ed. t. XXXIII.]

There are several closely allied forms, some of them produced, under cultivation, from spores of *multifidum*, which it seems best to notice as sub-varieties, namely—

— *multifidum minus* (M.). Apparently a dwarf form, six to eight inches high, multifid at the apex of the fronds, and divided into a little pencil-like tuft at the caudately attenuated tips of the pinnæ. It has been sent from Ilfracombe by Mr. C. Jackson.

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— *multifidum ramosum* (M.). A form raised from spores by Mr. Clapham. It has short broad fronds, more slender and lax than *multifidum*, and the pinnæ are here and there unequally branched. The pinnules are narrower and somewhat depauperated; they are also more raggedly multifid at their apices. The whole plant has a ragged and semi-depauperated appearance.

— *multifidum semi-depauperatum* (Sim.). This form has the apex and one side of the frond as in *multifidum*, from which it was raised. The peculiarity is, that on the other side, the pinnæ are much diminished in size or altogether wanting, the one half of the frond being therefore excessively depauperated. It is a curious form, raised a few years since, by Mr. Sim of Footscray.

56. *inexpletum* (M.). A very curious much depauperated form, chiefly remarkable for its ragged and incomplete appearance. The fronds are slender, lax, a foot and a half high, and broad-lanceolate, their apices and those of the pinnæ depauperately caudate, and somewhat tasselled. The pinnules are decurrent, narrow or linear where perfect, but very generally more or less depauperated, and sometimes reduced to a mere rib. The tassels on the tips of the pinnæ are small and slender. It was raised from spores of *multifidum*, a few years since, by Mr. Sim of Footscray.

57. *apuæforme* (M.). A small form related to *multifidum*, but apparently distinct, of dwarf habit, and remarkable for the fish-like outline of its fronds, which has suggested the name *apuæforme*. The fronds are eight to ten inches long, and two to four inches wide in the broadest part just below the middle. In the smaller sterile fronds, the outline is exactly ovate-lanceolate, and very regular on account of the truncately dilated tips of the pinnæ; the base of these fronds represents the head, and the rather attenuated apex breaking out into a flat repeatedly forked tuft represents the tail of a small fish. The pinnæ in these sterile fronds are forked at the tips, but the divisions are blunt and do not separate, so that the development does not extend beyond a squarish expansion or dilatation of the parts, while the apex of the frond is several times forked, nearly or quite flat, the ends of the divisions being all abrupt like the pinnæ. The mature fertile fronds are about ten inches high, rather more lax and open, but with the same general

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outline; the pinnæ are more tapered and more decidedly multifid and terminate in a small spreading somewhat crispy tuft; the pinnules are small oblong sessile or mostly decurrent, and laciniately pinnatifid and toothed. It is an elegant dwarf variety, and was communicated by Messrs. Stansfield of Todmorden, with the information that it had been found at Ayburn Wyke, near Scarborough, by Mr. J. Horsfall.

58. *concinnum* (M.). This is a very beautiful form, less decidedly multifid than some other varities, and usually multifid only in its autumnal growth, the early fronds as we learn from Mr. Wollaston being seldom divided. The fronds are vigorous, broad-lanceolate, apparently not divided at the apex. The pinnæ are linear oblong and terminate, when characteristic, in a small multifid tuft. The pinnules are ovate acute distinct, evenly and deeply pinnatifid below, and toothed with fine sharp even teeth at the apex; the lobes are narrow oblong and furnished, principally at their tips, with fine even acute teeth. The whole appearance of the plant is neat and elegant, and the very regular toothing is remarkable. The plant was found by Mr. Clapham, near Scarborough, in Yorkshire.

59. *multiceps* (M.). This is one of the most beautiful varieties yet obtained. The fronds and pinnæ are multifid-crisped on the same general plan as those of *multifidum*, but they combine with the symmetrical fronds of this form the singular lacerate tassels of *depauperatum*. The fronds are vigorous, about two feet high, broad lanceolate, with a broad fan-shaped or corymbosely tufted terminal crispy tassel consisting of five or six branches, into which the rachis separates, each branch many-times dichotomously divided, the tassels consisting of narrow lacerate divisions fringed throughout with small leafy lobes. The terminal tassel when laid flat measures five inches across. The pinnæ consist of rather unequal oblong inciso-serrate pinnules at the base, and gradually narrow towards the apex by the shortening of the pinnules, till they again spread out into large lacerate many-times divided terminal tassels, which form an uniform border to the frond; these tassels are about an inch and a half long, and some of the largest measure two inches across when flattened out. It is certainly a most charming variety, and a valuable addition to the crested forms of hardy Ferns. It was found in Corn-

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wall, a few miles from Truro, and was communicated by Messrs. Veitch and Son, of Exeter and Chelsea.

60. *thyssanotum* (M.). Another very handsome tasselled form of vigorous habit, two feet or more in height, lanceolate, the apices of the fronds and of the pinnæ symmetrically developed into spreading crispy tasselled tufts. The pinnæ are oblong, narrowed but slightly below the tassel; the pinnules are oblong, flat, often dilated at the apices, pinnatifid with the lobes toothed. It may be regarded as a tasselled variety, of that form of the species represented by *trifidum*, and is a handsome plant, superior to *multifidum* on account of the fronds forming a flat surface and not becoming curled. It was found in Guernsey, by Mr. James of Vauvert. [Plate LXII.]

61. *corymbiferum* (M.). A beautiful robust tasselled variety, certainly entitled to rank amongst the very handsomest of the forms yet known, and distinguishable from the other tasselled forms by the great breadth of its pinnules, by the larger size of its terminal tufts when properly grown, and by its red stipes and rachis. The medium sized fronds, from pot plants, are about a foot and a half long and six or eight inches broad, symmetrically tasselled throughout the margin. The pinnæ are approximate, oblong, not much tapered towards the tassel which is large and broad, and consists of dichotomous divisions of the rachis along which the ordinary pinnules are continued, thus giving breadth and importance to the tuft; the pinnules are broad oblong blunt, more or less connected as in the *molle* type, and they are set nearly close on the rachides, so that the whole frond has an appearance of breadth, and of being filled out and completed, which greatly adds to its beauty. The terminal tuft is large and spreading, and bears pinnules throughout. When freely grown, as in some specimens forwarded from Guernsey, the fronds are two to three feet long, and the corymbose apex is much more developed; the rachis first of all dividing into three branches about six or eight inches below the apex, and these branches becoming bipinnate, and tufted at the ends similar to the smaller-sized fronds already described. When in this state it is remarkably fine. It was found in Guernsey, by Mr. James of Vauvert. A similar form has since been raised by Mr. Elworthy from spores of *polydactylon*. [Plate LXIII.]

62. *grandiceps* (M.). A very distinct and handsome tasselled

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variety, having fronds a foot long, exclusive of the stipes. They are bipinnate, with distant pinnæ, the apex being developed into a large multifid-crispy head broader than the frond. This great terminal head and the small size of the tufts on the pinnæ are the characters that distinguish the variety, The pinnæ up to the very base of the tuft terminate in small inconspicuous tassels, the lower pinnules being short oblong and blunt. The terminal tuft measures from its base to its extremity about three inches and a half, and in width about five inches; it is made up of a dense crowd of segments forming a roundish crispy mass. This very marked variety was found in Somersetshire: near Nettlecombe, by Mr. Elworthy, and at Huish-Campflower, near Wiveliscombe, by Mr. J. Morse.

63. *depauperatum* (Woll.). A remarkable monstrosity with tasselled fronds, differing from most of the foregoing in its being of unsymmetrical development. The fronds are from eight inches to a foot high, their apex deeply lacerated or split up into numerous segments forming a largish corymbiform head or tassel. The pinnæ are also tasselled in the same way, with finely cut lacerate narrow segments; below the tassel they are depauperated, laciniated, and irregular; the pinnules also being very irregular, bluntly toothed, and frequently altogether wanting. The sori are often abortive. It is a very rare variety, and was, it appears, found many years since near Ben Bulben in Sligo, Ireland, by Mr. J. Gunning, who was at that time foreman in the Dublin College Botanic Garden: from whence it was distributed by Dr. J. T. Mackay. There appear to be two slightly varying forms in cultivation: one in which the tassel is ragged, with loose narrow segments, the other having a somewhat fuller and more compact tassel. It is possible these differences may have resulted from propagation by spores. [Plate LXIV A.—Folio ed. t. XXXIV B.]

64. *acrocladon* (Claph.). This is a dwarf curly tufted form resembling *crispum*, but differing obviously in the ends of the divisions growing out into narrow projecting points. Being a plant of variously branched habit, no two fronds are quite alike; we shall therefore describe the most perfectly developed of those before us. This frond is six or seven inches high, branched at the base of the stipes. One of the two principal branches bears two lateral branches

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besides the apical portion; the other bears a tuft of three branches and then a single branch below the apical part. In general character the branches are alike; they bear a few distant pinnæ which are from a quarter of an inch to an inch in length, these pinnæ bearing short oblong laciniate-toothed pinnules, and a little terminal tuft of branchlets; then comes the terminal head, a densely-branched mass of finely-divided segments, averaging about a couple of inches in depth, and two to three inches in breadth. The branches forming these crispy tufts bear a few ordinary pinnules at the base, but at the extremity they are divided into a multitude of fine divisions which are laciniately toothed. The other parts are similarly divided. There are a few of the small pinnæ on the main branch below the secondary branches. Other fronds branch higher up, and have rather more developed pinnæ, and the apex more spreading and less tufted, but divided in the same way. It is one of the most elegant of dwarf crispy ferns. The plant was gathered some years since on the moors near Rievaulx Abbey, by Mr. C. Monkman, and is in the possession of Mr. A. Clapham, to whom we owe our knowledge of it. [Plate LXV.]

65. *crispum* (M.). This singular variety has more the appearance of a tuft of fine curled parsley than of a Fern. It is of slender and dwarfish habit, usually about six or eight inches high, but sometimes upwards of a foot. The fronds are ramified in every possible way, the rachis being divided irregularly, and each apex densely tufted in compact obtuse tassels. The pinnæ and pinnules are very unsymmetrically divided, and the former are frequently wanting for a long portion of the stipes. The fructification is generally abortive, but not always so. It is a very elegant dwarf plant, and was originally found by Mr. A. Smith, on Orah, a hill in the county of Antrim, Ireland. Subsequently it has been gathered in Corymulzie Lynn, Braemar, Scotland, by Sir W. C. Trevelyan; and still more recently at Todmorden, Lancashire, by Mr. J. Huddart. [Plate LXVI.—Folio ed. t. XXXIV A.]

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Genus VII: **ASPLENIUM**, *Linnæus.*

Gen. Char.—**Sori** indusiate, linear, short or elongate, oblique; the **receptacles** lateral on the anterior side of the veins. **Indusium** linear, membranaceous, plane or fornicate. **Veins** simple or forked from a central costa, sometimes simple and costæform in the ultimate narrowly-cut segments; or forked from the base of the segments, the costa being evanescent or wanting; **venules** parallel, direct, free.

Fronds coriaceous, herbaceous, or membranaceous; simple lobed pinnate bipinnate or variously decompound, rarely rachiform; the rachis or veins sometimes proliferous. Sori usually on the anterior side of the venules, but often inverse in the basal auricles, sometimes double, *i.e.*, diplazioid, or scolopendrioid.

Caudex short, erect or decumbent, rarely creeping, sometimes stoloniferous.

This very extensive and rather variable genus of Ferns is tolerably well represented in the British Flora, nine species being found in Great Britain, and these representing two of the four principal groups into which the genus is separated. Its nearest affinity among the British Ferns is with *Athyrium*, from which it differs in having straight sori, the fructifications not being recurved, or if occasionally slightly crescentic, neither hamate nor hippocrepiform. It is also related to *Scolopendrium*, from which it differs in having the fructifications normally single, not growing in pairs standing face to face. Its straight linear simple oblique sori, therefore, separate it on either hand from these allied genera.

The fructification of *Asplenium*, like that of *Athyrium* and *Scolopendrium*, is lateral on the veins; that is to say, instead of growing up from the back or mid-surface of the veins, as the naked dots of the *Polypodieæ* and the indusiate dots of the *Aspidieæ* do, its spore-cases grow along the side of the vein which forms the

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receptacle, and the indusium which covers them is also attached laterally. This peculiarity, conjoined with a simple condition of the sorus, indicates the *Aspleniæ*, among which the genus *Asplenium* itself is distinguished by its simple sori and free veins, from other genera, agreeing in fructification, but separated by the various modes of reticulation which occur in their venation.

The genus is broken up into four sectional groups, of which, as already indicated, two only are represented among British species, namely:—§ *Euasplenium*, in which the sori are oblong or linear, and the veins either simple or forked, and divergent at an obtusish angle from a central costa, or in some exotic species dimidiately-forked from the one-sided development of the parts of the fronds—this group being exemplified by *Asplenium lanceolatum* and *marinum*; and § *Acropteris*, in which the sori are linear, and the veins either flabellately-forked without a costa, or simple or forked at a very acute angle from an indistinct or evanescent costa, as represented in *Asplenium Ruta-muraria*, and its allies. The remaining groups are:—§ *Darea*, having the sori oblong, and the veins for the most part simple in the narrow unisoriferous ultimate segments—this group being well represented by the *Asplenium flaccidum* of New Zealand, and the Javanese *Asplenium Belangeri* (*A. Veitchianum*); and § *Allantodia*, in which the sori are short oblong, covered by convex or fornicate indusia, and in some cases situated at the base of the veins, which are simple or forked from a costa—the group being exemplified by the *Asplenium umbrosum* (*A. Aitoni*) of Madeira. The sorus in § *Euasplenium*, § *Acropteris*, and § *Darea*, is covered by a normally plane or flat indusium, quite different from the vaulted cover which occurs in the § *Allantodia*.

The British representatives of the section *Acropteris* have been collected into a genus *Amesium*, by Mr. Newman; but the absence of a midvein to the fronds, which is the only tangible character on which this genus was based, is assuredly not of sufficient importance to warrant the separation of the species referred to it from the other forms of *Asplenium*. Another of the species which we retain in the genus, namely, *fontanum*, was included by Roth in *Athyrium*, and is even now placed there by some authors, but it does not agree in the chief characteristic on which we rely to distinguish *Athyrium*,

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namely, the hippocrepiform sori, and as its short sori, which might appear to connect it with § *Allantodia*, have not the vaulted indusia of that group, we leave it among the short-fruited *Euaspleniums*.

The generic name is a latinized form of the Greek *asplenon*, which signifies Spleenwort, and comes from *a*, privative, and *splen*, the spleen. The English name Spleenwort is generally adopted.

SYNOPSIS OF THE SPECIES.

§ **Euasplenium.**—*Sori oblong or linear; veins simple or forked and divergent at an obtusish angle from a central costa.*

* *Fronds bi-tri-pinnate, rarely sub-bipinnate.*

† *Fronds lanceolate; sori short, i. e. oblong.*

1. **A. fontanum**: fronds small (3-8 in.) narrow, linear-lanceolate, bipinnate; rachis smooth, narrowly winged.

2. **A. lanceolatum**: fronds larger (6-18 in.) broader lanceolate, bipinnate; rachis minutely scaly, margined in front, not winged.

   var. **microdon**: fronds linear, scarcely lanceolate, pinnæ sub-pinnate or lobed only at the base, the pinnules mostly confluent, wavy.

†† *Fronds ovate or deltoid; sori linear elongate.*

3. **A. Adiantum-nigrum**: fronds bi-tri-pinnate; segments oblong-wedge-shaped or sub-trapezoid, shallowly lobed or toothed, teeth acute; fronds and pinnæ acute or acuminate.

   var. **acutum**: fronds tripinnate; segments narrow-lanceolate, inciso-pinnatifid, the lobes linear erect acute; fronds and pinnæ caudate.

   var. **obtusatum**: fronds bipinnate; pinnæ bluntish; pinnules ovate, their blunt apices toothed.

   var. **microdon**: fronds sub-bipinnate, pyramidal or elongate-deltoid; lower pinnæ hastate, stalked, the rest sub-hastate more or less confluent; the upper ones confluent; sori often scolopendrioid.

** *Fronds pinnate, (sub-bipinnate in* A. marinum, *v.* sub-bipinnatum).

† *Rachis winged.*

4. **A. marinum**: fronds coriaceous, pinnate; pinnæ oblong, truncate-auricled at the upper, cuneate at the lower base, obtuse, crenated or toothed.

   var. **trapeziforme**: pinnæ shorter, less auricled, trapeziform, crenately toothed, the lower ones deflexed.

   var. **incisum**: pinnæ small, blunt, unequally inciso-pinnatifid, the lobes obscurely crenate.

   var. **ramosum**: pinnæ obliquely ovate or triangular, the margin lobate; stipites usually two-branched, or united in pairs at or near the base.

   var. **acutum**: pinnæ elongate linear-oblong, truncate-auricled, tapered to an acute point, crenate.

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var. **assimile**: pinnæ elongate linear-oblong, truncate-auricled, narrowed upwards, with large, distant, toothed lobes.

var. **sub-bipinnatum**: pinnæ sub-pinnate at the base, pinnatifid throughout, with elongate serrated lobes.

†† *Rachis not winged.*

‡ *Rachis ebeneous throughout, blun tly keeled behind.*

5. **A. Trichomanes**: fronds pinnate, herbaceous; pinnæ small, oblong, deciduous, entire or crenate, obliquely cuneate at the base, attached by the lower angle.

(*a*) *Fronds normal.*

var. **incisum**: pinnæ deeply pinnatifid, the segments inciso-serrate.

var. **subæquale**: pinnæ oblong, crenated or sinuate, nearly equal-sided, attached at or near the centre of their base.

(*b*) *Fronds abnormal or monstrous.*

var. **cristatum**: fronds symmetrically multifid-crisped at the apex; rachis undivided below.

var. **multifidum**: rachis bi-tri-chotomously divided below, the apices of the branches multifid-crisped.

var. **ramosum**: rachis bi-tri-chotomously divided below, the branches flat and tapering to the point.

‡‡ *Rachis green above, compressed.*

6. **A. viride**: fronds pinnate, herbaceous; pinnæ roundish-ovate or rhomboidal, crenated, stalked, persistent.

§ **Acropteris.**—*Sori linear, usually elongate; veins (in the British species) flabellately-forked, without a costa.*

* *Fronds bipinnate.*

7. **A. Ruta-muraria**: fronds deltoid; pinnules obovate or cuneate-rhomboidal, the anterior margin equally toothed; indusium crenulate.

var. **cuneatum**: pinnules wedge-shaped, the larger ones three-lobed.

var. **cristatum**: apex of the fronds and pinnæ dilated and crisped.

** *Fronds pinnate.*

8. **A. germanicum**: fronds linear (rarely bipinnately divided); pinnæ alternate narrow oblong wedge-shaped, unequally toothed at the apex; indusium entire.

*** *Fronds rachiform, pinnatifidly cleft.*

9. **A. septentrionale**: fronds simple or divided into 2-3 rachiform segments, which have distant linear marginal teeth; indusium entire.

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THE SMOOTH ROCK SPLEENWORT.

ASPLENIUM FONTANUM.

A dwarf; fronds narrow or linear-lanceolate broadest upwards, rigid, glabrous, bipinnate; pinnæ oblong-ovate; pinnules small, obovate-cuneate, with a few large angular pointed teeth; rachis narrowly winged throughout; sori short, oblong. [Plate LXVII.]

ASPLENIUM FONTANUM, *Bernhardi, Schrad. neues Journ. Bot.* 1806, i., part 2, 26. *Smith, Eng. Fl.* 2 ed. iv. 299. *Hooker & Arnott, Brit. Fl.* 7 ed. 589. *Deakin, Florigr. Brit.* iv. 62, in note. *Moore, Handb. Brit. Ferns,* 3 ed. 162; *Id., Ferns of Gt. Brit. Nature-Printed,* t. 35 A. *Bentham, Handb. Brit. Fl.* 632. *Sowerby, Ferns of Gt. Brit.* 45, t. 26, (*bad*). *Brown, Prod. Fl. Nov. Holl.* 150, *in obs. Sprengel, Syst. Veg.* iv. 86. *Sadler, Fil. Hung.* 26. *Link, Fil. Sp.* 95. *Mettenius, Fil. Hort. Bot. Lips.* 77; *Id., Asplen.* 140. *Lowe, Nat. Hist. Ferns,* v. t. 21 B.

ASPLENIUM HALLERI, *Sprengel, Syst. Veg.* iv. 88. *Sadler, Fil. Hung.* 27. *De Candolle, Fl. Franç.* v. 240. *Link, Fil. Sp.* 95. *Koch, Syn.* 2 ed. 982. *Ledebour, Fl. Ross.* iv. 519. *Nyman, Syll. Fl. Europ.* 432.

POLYPODIUM FONTANUM, *Linnæus, Sp. Plant.* 1550. *Smith, Fl. Brit.* 1114. *Bolton, Fil. Brit.* 38, t. 21. *Poiret, Enc. Bot.* v. 526.

POLYPODIUM ALPINUM, *Lamarck, Fl. Franç.* 1 ed. 22.

ASPIDIUM FONTANUM, *Swartz, Schrad. Journ. Bot.* 1800, ii. 40; *Id., Syn. Fil.* 57. *Willdenow, Sp. Plant.* v. 272. *Schkuhr, Krypt. Gew.* 52, t. 53. *Smith, Eng. Bot.* xxix., t. 2024.

ASPIDIUM HALLERI, *Willdenow, Sp. Plant.* v. 274. *Poiret, Enc. Supp.* iv. 518.

ATHYRIUM FONTANUM, *Roth, Fl. Germ.* iii. 59. *Sadler, Adumb. Epiphyll. Hung.* 20. *De Candolle, Fl. Franç.* 3 ed. ii. 557. *Presl, Tent. Pterid.* 98. *Babington, Man. Brit. Bot.* 4 ed. 425. *Gray, Nat. Arr. Brit. Pl.* ii. 10. *Fée, Gen. Fil.* 186.

ATHYRIUM HALLERI, *Roth, Fl. Germ.* iii. 60. *Presl, Tent. Pterid.* 98. *Fée, Gen. Fil.* 186. *Mettenius, Fil. Hort. Bot. Lips.* 77.

Caudex short, erect, tufted, somewhat scaly. *Scales* subulate, dark brown, semi-transparent, striately venose with elongate parallel areoles. *Fibres* slender, branched, tomentose.

Vernation circinate.

Stipes short, slender, dark purplish brown, and furnished with a few small deciduous scales at the base, becoming green upwards; terminal and adherent to the caudex. *Rachis* green, with a narrow

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elevated margin or wing throughout, the margin extending nearly to the base of the stipes.

Fronds averaging four or five inches in height, but varying from about three to ten or twelve inches, rigid, dark green, smooth, erect or spreading, narrow-lanceolate, broadest above the middle, bipinnate. *Pinnæ* oblong-ovate, spreading; the lower ones smaller, palmately three-lobed and more distant; the uppermost ones oblong, and more crowded. *Pinnules* roundish obovate, tapering to the base, the lower ones distinctly stalked on the narrowly-winged secondary rachides, the upper ones decurrent; their margins deeply notched, with from two or three to five or seven coarse, angular, spinosely-mucronate teeth.

Venation of the principal pinnules consisting of a flexuous *costa* or midrib, sending off alternate simple *veins* one of which is directed towards each tooth, and extends almost to its apex.

Fructification on the back of the frond, most copious upwards, but extending nearly to the base. *Sori* small, short oblong, from two to four on each pinnule, attached near the base of the veins on their anterior side, at first distinct, but often at length becoming confluent and forming large shapeless masses over the centre of the pinnules; indusiate. *Indusium* short oblong, white, usually straight, but sometimes a little curved behind, rounded entire and sometimes slightly wavy on the anterior free margin. *Spore-cases* small, roundish. *Spores* angular, rough.

Duration. The caudex is perennial. The fronds are persistent, the plant being evergreen, and continuing in growth the whole year, under favourable conditions.

This Fern is readily known among the British *Aspleniæ*, by its bipinnate fronds, taken in conjunction with their small stature, and the minuteness of their parts, six inches in length for the frond, and half an inch for the pinnæ being rather above the average growth. Apart from this discrepancy in size, it very much resembles the small bipinnate states of *Asplenium lanceolatum*, the structure of its parts being nearly identical, but in the latter the lower pinnæ do not diminish in so marked a degree.

Roth when establishing his genus *Athyrium*, included the present

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species, and some modern botanists continue to do the same; but the plant is too nearly akin to *Asplenium lanceolatum* to be separated from it, and the general structure of its sori is asplenioid not athyrioid. There is occasionally manifested a slight tendency to produce the arcuate sori characteristic of *Athyrium*, but this is very rare, and does not occur in a sufficient degree to necessitate the removal of the species from the neighbourhood of *Asplenium lanceolatum*, with which in all other respects it so exactly accords.

This rupestral and mural species is one of our rarest native Ferns, and is, indeed, considered by many botanists as altogether an alien. It is true that it has latterly been found only in situations which seem to support this opinion, but there are also positive statements of its having been found in a wild state, that we cannot reject. Moreover, while many probable situations for it remain unsearched by a scrutinising eye, we are unwarranted in concluding that it does not now exist in a wild state; and even if the search had been much more complete, the positive evidence which exists as to its former occurrence cannot be set aside. We are, therefore, as it seems to us, bound to retain it in the British Flora. Hudson first records our plant as a native, giving as habitats: Hammersham Church, and Wybourn, Westmoreland, from the former of which, according to Sir J. E. Smith, it was brought alive to Kew by the late Mr. Aiton. In Lightfoot's Herbarium, as we learn from Sir W. J. Hooker's account,* on the opposite folio to that on which are fastened specimens of this species, is written by Lightfoot himself: "This I gathered on Amersham Church, Bucks." Bolton certainly figures this very plant (the plate is dated 1785), and he writes thus of it: "Fountain Polipody is said to grow on old walls and rocks, above Hammersham Church; in stony places near Waybourn, in Westmoreland. The specimen here figured and described was sent to my brother, A.D. 1775, by a gentleman who gathered it in Buckinghamshire, and mistook it for the Acrostichum ilvense." Sir W. J. Hooker justly remarks, one does not see well how the accuracy of such statements, Lightfoot's personal one especially, can be called in question. Several more recent instances of

* Hooker, *Kew Journal of Botany*, vii. 341.

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its occurrence have been reported. Thus it is said to have been found growing on rocks near Alnwick Castle, on the authority of specimens belonging to the late Mr. Brown. In the British Herbarium formerly in possession of the Botanical Society of London we have seen specimens, which were stated to have been gathered in 1838, on rocks in Wharncliffe wood, Yorkshire, by Mr. Redhead; and others from Cavehill, Belfast, communicated by Mr. Newnham. Mr. H. Shepherd, of Liverpool, has communicated specimens said to have been found at Matlock, Derbyshire. We have also been informed by Mr. D. Hutcheson, formerly gardener at Boxley Abbey, Kent, that he has himself gathered this species in 1842, on moist rocks near the sea, a short distance north-east of Stonehaven, Kincardineshire, in a spot which has since been disturbed by the formation of the Aberdeen railway, so that in 1849 he was not successful in re-finding it. In 1845 the plant was found by Mr. Gibbs, gardener to the late D. Haigh, Esq., of Tooting, Surrey, on an old wall near the mansion, whence we have original specimens. In 1852 the Rev. A. Bloxam recorded two new habitats; one in Wales, between Tan-y-Bwlch and Tremadoc, Merionethshire, where the plant had been gathered by Dr. Power; the other, Swanage Cave, Isle of Purbeck, where it had been found by Miss Power; the specimens from this Welsh habitat, in Dr. Power's herbarium, were identified by Mr. Bloxam. Again, in 1852, the Rev. W. H. Hawker presented to the Linnean Society specimens from an old wall, near Petersfield, where, it appears, it had been observed for several years, growing in great luxuriance. In most of the foregoing mural stations except the last, the plant seems to have been at length destroyed, often by repairs; and as far as we know the few rupestral habitats have not recently afforded specimens. It is indeed, quite probable that the plant has been overlooked in its native haunts, and undoubtedly many localities where it might be expected to grow, have never been sufficiently examined. Of the foregoing records, the following is a summary:—

Channel.—Hampshire: near Petersfield, 1852, *Rev. W. H. Hawker.* Dorsetshire: Swanage Cave, near Tillavilly, Isle of Purbeck, 1852, *Dr. Power.*

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Thames.—Surrey: on an old garden-wall at Furze Down, Tooting, 1845, *Mr. Gibbs:* this wall has subsequently been cleaned, and the plants destroyed. Buckinghamshire; Amersham Church, *Lightfoot.*

N. Wales.—Merionethshire: between Tan-y-Bwlch and Tremadoc, 1852, *Dr. Power.*

Trent.—Derbyshire: Matlock, *H. Shepherd.*

Humber.—Yorkshire: Rocks in Wharncliffe wood, 1838, *R. M. Redhead.*

Tyne.—Northumberland: Rocks near Alnwick Castle, *R. Brown.*

Lakes.—Westmoreland: Wybourn, *Hudson.*

E. Highlands.—Kincardineshire: Moist rocks near the sea, N. E. of Stonehaven, 1842, *D. Hutcheson.*

Ulster.—Antrim: Cavehill, near Belfast, *Mr. Newnham.*

This species inhabits chiefly the central part of Europe. Besides the British stations, it is found in France: *e. g.* Arles, Jura; in Belgium; in Spain, on the Pyrenees; in Italy: *e. g.* Naples; among the mountains of Switzerland; in Germany, and Hungary; and in Greece. It also occurs in the Scandinavian kingdoms, according to Sadler; though Ledebour and Ruprecht appear to be doubtful of its occurrence in European Russia. In Asia, the species is recorded as a native of the Ural mountains, in Siberia; and it is found in Kashmir.

Asplenium fontanum is a frame or greenhouse Fern, particularly desirable in a limited collection on account of its small size and evergreen habit. The plant is easily grown, if carefully tended, but being of small size, it of course requires but a moderate share of pot-room, and like most of the small Ferns, *Aspleniæ* especially, the pots must be thoroughly drained. Small plants like this, too, require considerable care in watering, the condition to be aimed at being to keep the soil and the roots in a moderately moistened state, with as little fluctuation as possible. Hence, while the liberal supplies which would be required by larger and more rapidly growing kinds, would reduce this to an unhealthy condition, if it did not kill it, the small bulk of soil renders any neglect in the opposite direction, if it occurs in hot parching weather, liable to become fatal. When this amount of care is bestowed, the plant may be grown without risk of failure. It should be potted in porous soil,

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composed of turfy peat, with a small proportion of friable loam, and abundance of gritty silver sand. The crown of the plant may be advantageously raised somewhat above the general surface in potting, by being wedged, not too tightly, between two or three pieces of sandstone, or some similar porous material. It is increased without difficulty by division, if the operation is carefully performed in the growing season, and the divided plants are kept close till established. We have seen exhibited by Dr. Young, a magnificent mass of this plant, which could hardly have been less than a foot in diameter, with fronds eight to ten inches long. The species grows admirably in a shady hothouse.

This plant is not much given to variation. The fronds are occasionally bifid or multifid at the apex, and the plants which have this multifid tendency sometimes produce a few of the pinnæ unusually large; but no permanent variety has been observed. There are, indeed, two forms of the species to which the names of *fontanum* and *Halleri* have been given, but the differences between these two supposed species are obviously those arising from a greater or less degree of luxuriance, and disappear under the influence of uniform cultivation.

There is, besides, a garden plant of dubious origin, which has been supposed to belong to this species, and which Mr. Wollaston formerly proposed to call var. *proliferum*. Though from its size, and division, most like *Asplenium fontanum* of our British species, it is in fact quite unlike that plant in several important characters, and in some respects approaches the North American *Asplenium ebeneum*. We have not been able to recognise it in any published descriptions, nor to find any corresponding specimens in the Hookerian Herbarium. This interesting plant has been known to us since 1851, from fronds received from the gardens at Peper-Harrow Park, Surrey. It was subsequently exhibited at the metropolitan fêtes by Mr. Parker, nurseryman, of Hornsey: these plants being reported by Mr. Williams, then of Hoddesdon, to have been received by him a few years previously, as *A. viride*, from a gardener, whose friend named Filden, (who it appears died soon after the occurrence) had found them in Scotland, and had sent three roots. The

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plant is so remarkably distinct, that were it not for the obscurity of its history, we should have no hesitation whatever in admitting it as a species; and we are even now so convinced of its distinctness, that we append the following definition, in the hope that it may yet be recognised as a native Scottish plant.

A. refractum: fronds linear, subbipinnate; pinnæ short oblong obtuse, refracted, pinnate at the base, pinnatifid above; pinnules (the lowest anterior one only distinct, the rest more or less confluent) roundish, with a few coarse angular mucronate teeth, the upper two-four toothed, the lower ones overlapping; sori short oblong oblique, in a line on each side near the costa of the pinnæ; rachis chestnut-coloured, marginate above, not winged, bulbil-bearing.

ASPLENIUM REFRACTUM, *Moore, Ferns of Gt. Brit. Nature Printed*, under t. 35 A.

HAB. ? Scotland.

Compared with *Asplenium fontanum*, the fronds of *Asplenium refractum*, are longer and narrower in proportion, being seven or eight inches high, and not more than three-fourths of an inch wide. They have a dark brown rachis throughout, which is not distinctly winged, as in *fontanum*, although there is a slight green decurrent line at the upper angles between the pinnæ. The outline is different, being equal and almost linear, not broader upwards; the lower pinnæ are scarcely more distant than the rest, and all the pinnæ are refracted in a remarkable manner, as well as much less divided. The habit of growth is spreading, and the fronds are proliferous. The little bulbils are formed principally at the junction of the pinnæ with the rachis.

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THE LANCEOLATE SPLEENWORT.

ASPLENIUM LANCEOLATUM.

A. fronds lanceolate, rigid, glabrous, bipinnate; pinnæ ovate-lanceolate; pinnules obovate or obliquely ovate, blunt, lobed or toothed, the teeth coarse angular mucronate; rachis with slightly elevated margins in front, not winged, minutely scaly; sori short, oblong, produced towards the margin. [Plate LXVIII.]

ASPLENIUM LANCEOLATUM, *Hudson, Fl. Ang.* ii. 454. *Smith, Eng. Fl.* 2 ed. iv. 298; *Id., Eng. Bot.* iv. t. 240. *Deakin, Florigr. Brit.* iv. 67, fig. 1591. *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Babington, Man. Brit. Bot.* 4 ed. 425. *Bentham, Handb. Brit. Fl.* 632. *Newman, Hist. Brit. Ferns,* 3 ed. 219 (excl. syn. Viviani and Sadler). *Moore, Handb. Brit. Ferns,* 3 ed. 166; *Id., Ferns of Gt. Brit. Nature Printed,* t. 35 B. *Sowerby, Ferns of Gt. Brit.* 47, t. 27 (bad). *Swartz, Syn. Fil.* 83. *Willdenow, Sp. Plant.* v. 346. *Poiret, Enc. Supp.* ii. 515. *Sprengel, Syst. Veg.* iv. 88 (excl. syn.). *Presl, Tent. Pterid.* 108. *Link, Fil. Sp.* 97. *Fée, Gen. Fil.* 190. *Ruprecht, Dist. Crypt. Ross.* 42. *Lowe, Nat. Hist. Ferns,* v. t. 26. *Mettenius, Asplen.* 140. *Nyman, Syll. Fl. Europ.* 432.

ASPLENIUM ROTUNDATUM, *Kaulfuss, Flora,* 1830, i. 341. *Presl, Tent. Pterid.* 108.

ASPLENIUM BILLOTII, *F. Schultz, Flora,* 1845, ii. 738, according to Presl.

ASPLENIUM CUNEATUM, *F. Schultz, Flora,* 1844, ii. 807, according to Presl.

ASPLENIUM PERREYMONDII, *Balbis MS.;* according to Mettenius.

POLYPODIUM ADIANTIFOLIUM, *Poiret, Enc. Bot.* v. 540.

TARACHIA LANCEOLATA, *Presl, Epim. Bot.* 82.

Var. **microdon**; fronds pinnate; pinnæ undulated, with apiculato-dentate margins, lower ones distinct, obtuse, obliquely triangular or unequally cordate-subhastate, lobate below; upper ones narrower, confluent; sori short. [Plate LXIX.]

ASPLENIUM LANCEOLATUM, *v.* MICRODON, *Moore, Handb. Brit. Ferns,* 3 ed. 166; *Id., Ind. Fil.* 140.

ASPLENIUM MICRODON, *Moore, Hb.*

ASPLENIUM MARINUM, *v.* MICRODON, *Moore, Ferns of Gt. Brit. Nature Printed,* under t. 38.

Caudex short, thick, erect or decumbent, tufted, densely scaly. *Scales* elongately subulate, shining brown, striately veined. *Fibres* stout, branched, tomentose.

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Vernation circinate.

Stipes short, usually about a third the length of the frond, sometimes longer, dark chestnut-coloured below, the dark colour extending more or less along the back of the rachis, sparingly scaly; terminal and adherent to the caudex. *Rachis* flat, with slight elevated margins in front, rounded behind, furnished sparingly with slender jointed hair-scales; *partial rachides* winged, and furnished with similar hair-scales.

Fronds from three or four inches to a foot, or occasionally eighteen inches in length, rigid, bright green, erectish, smooth except on the rachides, lanceolate, bipinnate. *Pinnæ* broadest at the base, narrowing to the point, usually horizontal, sometimes deflexed, scarcely more than half an inch in the smaller, two inches long in the larger fronds, all even the lowest scarcely stalked, sub-opposite or alternate; the lower more distant and somewhat shorter. *Pinnules* obovate, obliquely-ovate, or dimidiately sub-quadrate, the anterior side being most developed, always more or less cuneate at the base. In the larger fronds the pinnules are pinnatifid below, with obovate sharply-toothed lobes, and coarsely toothed above, the teeth being mucronate; whilst in the smaller fronds the lobes are scarcely developed, the margin being coarsely mucronately-toothed. Occasionally the lower pinnæ are longer; sometimes the fronds are narrow and only pinnate with lobed pinnæ; and in other instances they are membranaceous.

Venation of the pinnules consisting of a flexuous *costa* or midvein, alternately branched, the lowest anterior *vein* directed to the principal lobe, and developing as many *venules* as there are marginal teeth, one venule extending into each tooth, but not quite reaching the margin; the other veins are forked or simple, and correspond in number with the teeth. The termination of the veins is marked on the upper side of the fronds, by a depression of the surface.

Fructification on the back of the frond and scattered over the whole surface. *Sori* indusiate, oblong, produced along the anterior sides of the venules, that is, above the fork of the veins, occupying rather the centre of the lobes than the centre of the pinnules, and therefore, sub-marginal in appearance; at first distinct, but becoming confluent in irregular masses on the lobes, and sometimes so

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abundant as to become in age confluent over nearly the whole frond. Occasionally the sori are set back to back on the venule. *Indusium* a white, oblong membrane, slightly irregular or wavy on the free or anterior margin. *Spore-cases* globose. *Spores* ovate, angular, roughish.

Duration. The rhizome is perennial. The fronds are persistent, and under shelter are produced at various times throughout the year, so that the plant is evergreen.

The nearest affinity of this plant among the British species is with *Asplenium Adiantum-nigrum*, from which it may be known (1), by its lanceolate, not deltoid, outline; (2), by the presence of hair-scales on its principal and partial rachides; (3), by the form of the sorus, which is oblong, not linear, the sori in this species being nearly represented in appearance by the upper half of those of *Adiantum-nigrum;* and (4), by the position of the sorus, which is in this species produced above, and in *Adiantum-nigrum* below, the fork of the veins; in the latter, consequently, the sori are nearer the costa, and central with respect to the pinnules, whilst in *lanceolatum* they are submarginal. The texture also is thinner, and the pinnules are shorter, and more equable in size.

Though not entirely confined to the sea-coast, this plant must be regarded as a maritime or submaritime and also a southern species. Its head quarters seem to be the shores of the Bristol Channel, as it occurs from the Land's End throughout the peninsula formed by the counties of Cornwall and Devon, and through Somerset to Gloucestershire on the one side, and in the counties of Glamorgan and Pembroke on the other; thence continuing along the shore of Cardigan bay, appearing in the counties of Merioneth and Carnarvon, and perhaps Denbigh, one of its stations, near Llanrwst, being near the boundary of these counties. It again occurs in a more southward and inland station, at Tunbridge Wells. There are some doubtful records of its occurrence in Oxfordshire, Shropshire, and Yorkshire; the latter record, according to Bolton's figure, certainly pertaining to *Asplenium Adiantum-nigrum*. The true *Asplenium lanceolatum* has been recently found by Mr. Woods, at Kinsale, Cork, and is thus added to the Flora of Ireland, in which country other

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localities may be expected to reward a diligent search. Link states that it is found near Gilphead in the west of Scotland, but though not unlikely, we do not find his statement confirmed. In the Channel Islands, as at Sark, Guernsey, and Jersey, it again occurs, and at least in the two last-mentioned in profusion. Its favourite localities are the crevices of rocks and old walls, the sides of wells, and the shafts of deserted mines. Mr. N. B. Ward has favoured us with an account of a magnificent tuft which he found, along with others, almost closing the mouth of a well, in the island of Jersey; the fronds of this plant were a foot or more in length, and the plant bore no fewer than one hundred and twenty perfectly fresh fronds, besides the remains of sixty or seventy others in various stages of decay. Mr. Ward found it most abundant in the western side of the island, varying much in situation and in size: on dry fully exposed walls, scarcely more than a couple of inches long; while on the densely-shaded dry sandstone banks, and when lining the interior of wells, it grew upwards of a foot in length. Mr. Watson gives it an altitude of 600 feet in Wales; but Mr. Bennett reports finding it at an elevation of 700 feet, at Barmouth. The Carnarvon or Denbigh habitat is, no doubt, equally elevated. The following are some of the stations which are known:—

Peninsula.—Cornwall: St. Michael's Mount, and other places about Penzance, abundant, *E. T. Bennett;* Logan Rock, *D Pierson;* rocks at Hot Point, and other stations near the Land's End; St. Ives, *Hudson;* Enys Penryn, *G. Dawson;* Scilly Islands, *W. C. Trevelyan.* Devonshire: Morwell rocks, on the Tamar, *F. H. Goulding;* banks of the Tavy opposite Virtuous Lady mine; banks of the Plym near Cann Quarry, *I. W. N. Keys;* Bickley Vale, *Rev. W. S. Hore;* Marwood, *Rev. F. Mules;* Shaugh, *R. J. Gray;* near the Tors, Lynmouth, *R. J. Gray;* Buckland Monachorum, *Rev. W. S. Hore;* Tavistock; Salcombe; Torquay, *Miss Griffiths.* Somersetshire: Selworthy, *Mrs. A. Thompson,* and elsewhere.

Channel.—Sussex: High Rocks, Tunbridge Wells.

Thames.—Kent: Tunbridge Wells, *E. Jenner.* ? Oxfordshire: Adderbury Church, *Bobart.*

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Severn.—Gloucestershire: River Frome, near Frenchay, *T. H. Thomas;* Beechly, *E. Lees;* Oldbury Court Woods, and Pennant Rocks, near Stapleton, *G. H. K. Thwaites.* ? Shropshire: Hagmon Hill, *A. Aikin.*

Humber.—? Yorkshire: the plant from Wharfe, referred to by *Bolton,* is according to his figure *A. Adiantum-nigrum.*

S. Wales.—Pembrokeshire: Ramsay Island, *E. Lees.* Glamorganshire.

N. Wales—Merionethshire: about Barmouth; between Barmouth and Dolgelly, *E. Newman.* Carnarvonshire; rocks above Tremadoc, *E. T. Bennett;* Careg-y-Ymbil in Pwllheli Harbour, *E. T. Bennett;* Beddgelert; about Aberglaslyn. Denbighshire: near Llanwrst, *W. Wilson.*

Munster.—Cork: Kinsale, *J. Woods.*

Channel Isles.—Guernsey. Jersey, more abundant on the western than the eastern side, *N. B. Ward.* Sark, *Miss C. E. Nixon.*

Asplenium lanceolatum occurs in the islands of Madeira and the Azores, and on the African coast at Algiers and Tangiers. In Europe it is found in Spain, Portugal, Western Germany, Belgium, Switzerland, and in France at Fontainbleau, Bourdeaux, Cevennes, and in Brittany, whence it crosses over to the British shores. It is consequently an Atlantic species.

This is a very ornamental species, and potted in well drained compost, consisting of a mixture of peat, loam, and sand, and subjected to the shelter of a shady frame or greenhouse where it is not kept excessively moist, it is one of the most manageable of the smaller evergreen species, and is always fresh and vigorous. A close Wardian case is said, however, to be inimical to it. It is not suited for rock work, or for exposed situations, except near the coast, as it requires a mild climate. The plant is increased in the ordinary way, by careful division.

There are but few varieties of this species at present known, and this small amount of variation may result from the limited area over which the species is distributed. There are one or two foreign

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varieties, one of which, *obovatum*, is found only in the south of Europe. The apex of the frond is bifid or multifid, but this is not permanent; and plants of proliferous habit have been observed, but this proliferous condition of the plant is exceedingly scarce, and is no doubt the result of some peculiarity in cultivation. The other forms known to us are—

1. *microdon* (M.). This is a most remarkable variety, so little divided that one is almost tempted to consider it a distinct species. In our folio edition, when the plant was but little known, and had only been seen of small size, it was regarded as a variety of *Asplenium marinum*, but the more vigorous fronds which it has subsequently produced, prove it to belong rather to *Asplenium lanceolatum*. The stipes is rather short, dark brown at the base, clothed with small hair scales; these also occur along the lower portion of the rachis, the back of which half-way up is brown like the base of the stipes. The fronds are irregularly linear, scarcely linear-lanceolate, with a tapered point, six to ten or twelve inches high, pinnate. The pinnæ are distinct but approximate in the lower part of the frond, shortly stalked, pyramidal, the lowermost triangular, all oblique from the greater development of the anterior side, sometimes subhastate, more or less deflexed, tapering to a blunt point; the upper pinnæ are shorter, crowded, more or less adnate with the slightly margined rachis, which is hair-scaly below. The pinnæ are lobed and undulated at the margin; the basal lobes rounded and divided nearly to the costa, but they overlap so that the division is not apparent; the divisions become shallower upwards, the lobes and confluent apex distantly toothed with small transparent apiculate teeth. In some of the lower pinnæ the anterior lobe is so much enlarged that the pinna appears to be unequally bifid, and the basal lobe is usually very much more separated than the rest. The sori are short oblong, smallish, distant from the costa, and covered by membranous wavy-margined indusia; they are usually placed on the anterior side of the veins opening anteriorly, as in *Asplenium* generally, but sometimes even in the less divided parts of the pinnæ they are here and there reversed and open towards the base, and scattered sori may be found, which are diplazioid, scolopendrioid, or even

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athyrioid. The denticulated margin with its small patent apiculated teeth is remarkable; and the small short dispersed sori, which in their disposition follow rather the margin than the midrib, point to *Asplenium lanceolatum* as the species to which it is to be referred, although it is very much unlike the fully developed state of that species. The mode of division, the toothing, and the texture agree also with *Asplenium lanceolatum*. Small plants resemble *Asplenium marinum* in the scaly crown, pinnate fronds, and margined rachides, but the texture and fructification are quite at variance with that species. Some Devonshire plants at first referred here, prove to be analogous forms of *Asplenium Adiantum-nigrum*, having deltoid fronds and elongated central sori. The variety *microdon* is a native of Guernsey, and was found in 1855, first by Miss Wilkinson, and subsequently in other stations by Miss Mansell, of the Quesne, and Mr. C. Jackson, to the latter of whom we are indebted for specimens, and for our knowledge of the plant. Mr. Jackson informs us that it grows on banks of rough masonry without mortar, and intermixed with *Asplenium lanceolatum*, at some distance from the sea. It has since been found within a short distance of Penzance, by Mr. G. Wager, and this plant which is somewhat more divided than the Guernsey form proves incontestably its relationship to the species to which we refer it. [Plate LXIX.]

2. *Claphamii* (M.). This is a very curious form closely allied to *microdon*, but apparently distinct, the fronds being still narrower, almost parallel-sided with an irregular or sinuated margin, and a short narrowed apex. The stipes and rachis are brown and scaly as in the species itself, and in *microdon*. The fronds are linear acute, the largest yet produced about five inches long exclusive of the short stipes, and three-fourths of an inch wide, pinnate in the lower part. The pinnæ are nearly equal in size, much imbricated, sessile with a narrow attachment at the base, becoming more and more adnate upwards, till in the upper half they become confluent; the lower ones are shortly and bluntly triangular, about the size and form of those of *Woodsia alpina;* above these they become obliquely but transversely oblong, from the upper or anterior basal angle growing out to about the same form and size as the pinna itself; in the upper half they all become confluent, so that this part of the frond is

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crenately lobed. There is no true lobing in the lower more distinct pinnæ, the enlarged angle not being separated by a sinus from the rest of the pinna, but the whole margin is toothed, and here and there apiculately-toothed as in *microdon*, but not very distinctly so. The sori are short, that is of the *lanceolatum* character, and usually asplenioid, but here and there they become diplazioid or scolopendrioid. The plant is an accidental seedling, which sprung up in the fernery of Mr. Clapham of Scarborough.

3. *laciniatum* (W.). The fronds of this variety are remarkably depauperated, the leafy portion being more or less and in some cases entirely wanting; the pinnæ and pinnules are frequently reduced to mere ribs or veins; and the fructification, which is generally very copious, protrudes on to the face of the frond, so that an inattentive observer would not distinguish the front from the back. It is a sub-permanent form, and occurs occasionally in the Channel Isles.

4. *crispatum* (M.). In this form, which is distinctly bipinnate, the margins of the lobes of the pinnules are so curled under as to give prominence to the thickened teeth which from the same cause are irregular in their direction; the pinnules thus acquire a somewhat crispy character. It was sent from Guernsey by Mr. C. Jackson.

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THE BLACK MAIDENHAIR SPLEENWORT.

ASPLENIUM ADIANTUM-NIGRUM.

A. fronds ovate or deltoid, acute or acuminate, glabrous, subcoriaceous, bi-tri-pinnate; pinnæ obliquely triangular, acute or acuminate; pinnules ovate or ovate-elongate-attenuate, pinnate or pinnatifid, the ultimate divisions oblong, or subtrapezoid, cuneate at the base, shallowly lobed with the lobes toothed or simply toothed: teeth acute; sori linear-elongate, contiguous to the midvein. [Plate LXX.]

ASPLENIUM ADIANTUM-NIGRUM, *Linnæus, Sp. Plant.* 1541. *Bolton, Fil. Brit.* 30, t. 17, fig. 1-3. *Smith, Eng. Bot.* xxviii. t. 1950; *Id., Eng. Fl.* 2 ed. iv. 297 (excl. β). *Deakin, Florigr. Brit.* iv. 64, fig. 1590. *Bentham, Handb. Brit. Fl.* 633. *Hooker & Arnott, Brit. Fl.* 7 ed. 589. *Mackay, Fl. Hib.* 342. *Babington, Man. Brit. Bot.* 4 ed. 426. *Moore, Handb. Brit. Ferns,* 3 ed. 170; *Id., Ferns of Gt. Brit. Nature Printed,* t. 36, fig. A, B. *Newman, Hist. Brit. Ferns,* 3 ed. 225. *Sowerby, Ferns of Gt. Brit.* 49, t. 28. *Schkuhr, Krypt. Gew.* 74, t. 80 *a*. *Swartz, Syn. Fil.* 84. *Lamarck, Enc. Bot.* ii. 309. *Willdenow, Sp. Plant.* v. 346. *Sadler, Fil. Hung.* 31 *Sprengel, Syst. Veg.* iv. 89 (excl. syn. Willd.). *Presl, Tent. Pterid.* 107. *Link, Fil. Sp.* 96. *Fée, Gen. Fil.* 191. *Sturm, Deutschl. Fl.* (Farn.) t 3. *Koch, Synopsis* 2 ed. 982. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 519. *Mettenius, Fil. Hort. Bot. Lips.* 77; *Id., Asplen.* 144. *Lowe, Nat. Hist. Ferns,* v. t. 25. *Heufler, Asplen. Europ.* 66, 76. *Pappe & Rawson, Syn. Fil. Afr. Aust.* 21. *Nyman, Syll. Fl. Europ.* 432.

ASPLENIUM ADIANTUM-NIGRUM, *v.* CAPENSE, *Schlechtendal, Adumbrationes Plant.* 31, t. 17.

ASPLENIUM ADIANTUM-LANCEOLATUM? *Hoffmann, Deutschl. Fl.* ii. 12 (excl. syn.)

ASPLENIUM NIGRUM, *Bernhardi, Schrad. Journ. Bot.* 1799, i. 313.

ASPLENIUM TRICHOMANOIDES, *Lumnitzer, Fl. Poson.* no. 1020, according to Sadler.

ASPLENIUM LUCIDUM, *Salisbury, Prod.* 403.

ASPLENIUM ONOPTERIS, *Linnæus, Sp. Plant.* 1 ed. 1081.

ASPLENIUM CUNEIFOLIUM, *Viviani, Fl. Ital. frag.* 16, t. 18, according to Presl.

ASPLENIUM ARGUTUM, *Kaulfuss, Enum. Fil.* 176. *Sprengel, Syst. Veg.* iv. 90. *Presl, Tent. Pterid.* 107. *Fée, Gen. Fil.* 191.

ASPLENIUM HUMILE, *Blume, Enum. Fil. Jav.* 185.

ASPLENIUM HEUFFELLI, *Wierzb. Hb. Kze.*

ASPLENIUM SILESIACUM, *Milde, Jahr. Schles. Ges. Vat. Cult.* 1855, 33; *Id., Nov. Act. N. C.* xxvi. part ii., 605, t. 114-115.

ASPLENIUM TABULARE, *Schrader, Gotting. gel. Anzeig.* 1818, 916, according to Kunze.

ASPLENIUM CAPENSE, *Linnæus MS., in Herb.*

PHYLLITIS LANCIFOLIA, *Mœnch, Meth. Supp.* 316.

TARACHIA ADIANTUM-NIGRUM, *Presl, Epim. Bot.* 82.

TARACHIA ARGUTA, *Presl, Epim. Bot.* 82.

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Var. **acutum**: fronds deltoid, tripinnate throughout, and as well as the pinnæ (the lower pair especially) caudate; ultimate pinnules narrow-lanceolate, inciso-pinnatifid, the ultimate lobes linear, erect, very acute, entire. [Plate LXXII.]

Asplenium Adiantum-nigrum, *v.* acutum, *Pollini, Fl. Ver.* iii. 288, t. 2, fig. 2*a*. *Newman, Hist. Brit. Ferns*, 2 ed. 259. *Moore, Handb. Brit. Ferns*, 3 ed. 170; *Id., Ferns of Gt. Brit. Nature Printed*, t. 37; *Id., Ind. Fil.* 110.

Asplenium acutum, *Bory MS. Willdenow, Sp. Plant.* v. 347, according to an authentic specimen, in Herb. Heward, communicated by M. Bory. *Newman, Hist. Brit. Ferns*, 3 ed. 230 (excl. syn. Smith). *Babington, Man. Brit. Bot.* 4 ed. 425. *Poiret, Enc. Supp.* ii. 515. *Sprengel, Syst. Veg.* iv. 90. *Sadler, Fil. Hung.* 31. *Presl, Tent. Pterid.* 107. *Fée, Gen. Fil.* 190. *Link, Fil. Sp.* 96. *Mettenius, Fil. Hort. Bot. Lips.* 77.

Asplenium Adiantum-nigrum, *Bory, Ess. Isles Fortunées*, 313.

Asplenium Adiantum-nigrum, *v.* angustatum, *Desvaux, Ann. Soc. Linn. de Paris*, vi. 278.

Asplenium Virgilii, *Bory, Expéd. de la Morée*, 289. *Gussone, Fl. Sic. Syn.* 662.

Asplenium productum, *Lowe, Trans. Camb. Phil. Soc.* vi. 524.

Asplenium Adiantum-nigrum Onopteris, *Heufler, Aspl. Europ.* 76.

Asplenium davallioides, *Tausch, Flora*, xxii. 479.

Asplenium patens, *Gaudichaud, Frey. Voy.* 320.

Tarachia acuta, *Presl, Epim. Bot.* 82.

Var. **obtusatum**: fronds ovate, smaller and less divided, bipinnate, or subbipinnate; pinnæ blunt or bluntish, not acuminate; pinnules ovate, their rounded apices toothed; rachis winged. [Plate LXXI A.]

Asplenium Adiantum-nigrum, *v.* obtusatum, *Moore, Handb. Brit. Ferns*, 3 ed. 170.

Asplenium Adiantum-nigrum, *v.* obtusum, *Newman, Hist. Brit. Ferns*, 2 ed. 258. *Moore, Handb. Brit. Ferns*, 2 ed. 155; *Id., Ferns of Gt. Brit. Nature Printed*, t. 36, fig. C, D (excl. var. syn.)

Var. **microdon**: fronds pyramidal, or elongate-deltoid, pinnate below; the pinnæ pyramidal, spreading, minutely sharp toothed; lower pair of pinnæ shortly stalked, cordately hastate and lobate at the base; the rest more or less adnate, subhastately auriculate, those of the upper half confluent into an irregularly pinnatifid apex; sori linear elongate, near the costa, often scolopendrioid.

Caudex short, stoutish, tufted, often decumbent, scaly. *Scales* lanceolate below, extended into a long hair-like point, dark purple-

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brown, shining, striately venose. *Fibres* numerous, branched, dark brown, tomentose.

Vernation circinate.

Stipes elongated, usually about as long as, sometimes longer than, the leafy portion of the frond, dark purplish brown, bearing about the base a few scales like those of the crown, smooth upwards, flat and slightly grooved in front, rounded behind; terminal and adherent to the caudex. *Rachis* channelled in front, from the presence of an elevated line on each margin decurrent from the stalk of the pinna, round, and with the brown colour of the base more or less extending upwards behind.

Fronds including the stipes from three or four to eighteen or twenty inches long, sometimes even more, and from one and a half to seven inches across the base of the leafy portion; usually coriaceous and shining dark green above, paler beneath, sometimes of thinner texture; deltoid or ovate, or sometimes with the sides nearly parallel below, always with a tapered or acuminated apex, usually bipinnate or tripinnate, but occasionally almost quadripinnate when of large size. *Pinnæ* obliquely triangular, usually elongate and attenuated at the apex, the lower nearly opposite, and always as long as, usually longer than the rest, the upper becoming alternate and gradually diminishing in size; all usually pointing upwards. *Pinnules* alternate; the basal one situated on the anterior side of the rachis, and considerably larger than the rest, broadly oblique ovate with an attenuated apex, pinnate or pinnatifid at its base, its lowest (secondary) pinnules or segments being ovate obtuse, and either pinnatifid with sharply serrated lobes below and sharply serrated at the apex, or merely toothed throughout. Towards the apex of the pinnæ, which are there more or less attenuated and elongated, the pinnules gradually become oblong and decurrent at their base; the same occurs on a smaller scale towards the apices of the larger lower pinnules themselves; while the upper pinnæ are like the lower *minus* their larger pinnules. In the smaller forms the pinnæ are less attenuated at the points, and the pinnules are shorter and blunter, and either barely divided to the midvein or merely lobed. The ultimate divisions are all notched with distinct acute serratures.

Venation of the secondary basal pinnules in the tripinnate fronds,

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and of the primary basal pinnules in the bipinnate fronds, consisting of a flexuous *costa* or midvein, which, by a series of furcations, sends out a *vein* or *venule* towards each marginal tooth. If the pinnule is not deeply lobed, and the teeth are simple, the veins are also simple, and bear the sorus on their lower half, commencing just above their base, and extending half-way to the margin; but if the pinnule is lobed below, one vein passing off into each lobe divides into venules corresponding to the number of marginal teeth, and one or more of these venules in the larger lobes bears a sorus; the smaller lobes are occupied by one furcation of the vein, which bears on its anterior side a long linear sorus, commencing near the midvein of the pinnule, and extending beyond the point of furcation. The venules reach up to the serratures, but not quite to their apex.

Fructification throughout the back of the frond. *Sori* linear elongate, indusiate, on the anterior side of the veins near their base, and therefore central with respect to the pinnule; crowded, and soon becoming confluent. *Indusium* linear, entire, pallid, semi-transparent, and apparently grayish from the dark colour of the spore-cases showing through it. *Spore-cases* globose, shining brown. *Spores* ovate, angular, roughish.

Duration. The caudex is perennial. The fronds are persistent through the winter, so that the plant is evergreen, and they are renewed annually late in spring.

The Black Maidenhair Spleenwort may be known from *Asplenium lanceolatum*, which among British species it most resembles, by its long-stalked triangular fronds and elongated central sori. It may generally be known also by its conspicuously-stalked lower pinnæ, and by its surface being of a more glossy texture, and its substance more coriaceous. No other of the British species are so much divided, unless indeed *acutum*, which we place as a variety, is held to be distinct, and that may be separated by its caudate fronds and pinnæ, and its linear ultimate segments.

The Black Maidenhair Spleenwort is a generally distributed plant, occurring on rocks, walls and sandy banks throughout England, Wales, and Scotland, extending to the Northern and Western Isles,

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Ireland, and the Channel Islands, and ranging from the coast level to an elevation of nearly 2000 feet in the Highlands. It varies, with comparatively small fronds and short blunt pinnules, and with large elongated fronds, acuminated pinnæ, and narrowish elongated pinnules; but these forms have no exact limits. The variety *acutum*, in its true form, has been hitherto found only in Ireland, namely, in the vicinity of Killarney, and on Cahir Conree, both in Kerry; and also on the Dublin mountains. The plant has been recorded from Jersey, but it seems probable that the Jersey plant is rather an attenuated intermediate form of the more usual state of the species. Sherard's plant from Mourne mountain, Down, the *Asplenium Adiantum-nigrum* β. of Sir J. E. Smith, and referred to *Asplenium acutum* by recent writers, is not referrible here, but to *Athyrium Filix-fœmina*. The species is too commonly met with to admit of a full list of localities being given, but an indication of its range will be afforded by the following summary :—

Peninsula.—Cornwall. Devonshire : Challacombe, and Marwood, *Rev. F. Mules;* Ottery St. Mary, *G. B. Wollaston;* Totnes; Teignmouth; Exeter. Somersetshire: Bath, *R. Withers.*

Channel.—Hampshire, and the Isle of Wight. Dorsetshire: Poxwell, near Dorchester. Wiltshire: Redlynch, Downton, *W. Moore.* Sussex.

Thames.—Hertfordshire. Middlesex. Kent. Surrey: St. Martha's Hill, Compton, and elsewhere near Guildford, Cobham. Berkshire. Buckinghamshire: Burnham. Oxfordshire. Essex: Norton Heath.

Ouse.—Bedfordshire. Suffolk. Norfolk. Cambridgeshire. Northamptonshire.

Severn.—Warwickshire : Stratford-on-Avon. Gloucestershire. Monmouthshire, *T. H. Thomas.* Herefordshire. Worcestershire. Staffordshire. Shropshire: Haughmond Hill, *Rev. W. A. Leighton,* and elsewhere.

Trent.—Leicestershire. Rutland. Nottinghamshire. Derbyshire.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire: Wensleydale, *C. H. Compton;* Ellington.

Tyne.—Durham. Northumberland.

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Lakes.—Westmoreland. Cumberland. North Lancashire.

S. Wales.—Radnorshire. Brecknockshire. Glamorganshire. Carmarthenshire: near Llechryd, *W. Hutchison.* Pembrokeshire. Cardiganshire.

N. Wales.—Anglesea. Denbighshire: Vale of Clyde. Merionethshire. Montgomeryshire. Flintshire: Kilken. Carnarvonshire

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Ayrshire. Lanarkshire. Renfrewshire.

E. Lowlands.—Roxburghshire. Berwickshire. Edinburghshire. Linlithgowshire.

E. Highlands.—Stirlingshire: Stirling, *Mrs. Macleod.* Clackmannanshire. Kinross-shire. Fifeshire: St. Andrews, *C. Howie;* Lomond Hills. Perthshire: Callander. Forfarshire. Kincardineshire. Aberdeenshire. Banffshire. Morayshire. Nairnshire.

W. Highlands.—Inverness-shire. Argyleshire: Campbelton, *A. Tait;* Ardrishiag. Dumbartonshire. Isles of Arran; Bute; Islay; Cantyre; and Iona. Ailsa Craig.

N. Highlands.—Cromarty. Sutherlandshire. Caithness.

N. Isles.—Orkney.

W. Isles.—Tarbet, Harris.

Ulster.—Antrim, *D. Moore.* Down. Donegal: Killybegs.

Connaught.—Galway: Gort; Connemara. Arran Isles. Mayo: Island of Achill.

Leinster.—Meath: Drogheda. Louth. Dublin. King's County. Wicklow: Glen of the Downs. Kilkenny.

Munster.—Kerry: Killarney. Cork. Waterford: Ardmore, *J. R. Kinahan.* Tipperary. Clare: Black Head. Limerick: Ballywilliam, *Mrs. Barrington.* Cork: Kinsale, *Miss Townsend.*

Channel Isles.—Jersey. Guernsey.

The present is a widely-dispersed species, the common forms occurring all over Europe, from South Scandinavia and the provinces of European Russia through Denmark, Belgium, France, Switzerland, Germany, Spain, Portugal, the Balearic Isles, Italy, Dalmatia, Croatia, Hungary, and Transylvania, to Greece and Turkey; specimens from Sicily show a transition from the variety *acutum* to the more common form. It is found in Teneriffe, Madeira, and the

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Azores, along with the variety *acutum*, and again in the Cape de Verd Islands. At Algiers there is found an intermediate form, and other forms of intermediate character occur in Abyssinia, and again at the Cape of Good Hope, along with the normal plant, the latter being also found in Natal. It has been observed at St. Helena, according to a specimen in the Hookerian Herbarium, and in the Mascaren Islands according to Bory. In Asia the species extends over a wide range, being found in Siberia, and Transcaucasian Russia; in Arabia, Armenia, and Syria; in Affghanistan, Kashmir, Mussoorie, and Simla, and in Java. Besides the Atlantic Isles already mentioned, including the Canaries, the variety *acutum* is found in Spain, Portugal, Italy, the southern parts of the Austrian empire, Corsica, Greece, and Cyprus; in Algiers, Natal, and South Africa; in the Sandwich Isles, Virginia, and Portorico. The North American plant referred to *Asplenium Adiantum-nigrum* by Michaux, the *Asplenium montanum* of Willdenow, is no doubt a distinct species.

This species was formerly reputed to possess medicinal power, and was employed in the treatment of coughs, asthmas, and similar affections of the chest, but its reputation has not been maintained. Its supposed efficacy was most probably based on a slight tonic quality, which it possesses in common with other ferns; or the relief attributed to its use may after all be only owing to the mucilage contained in its juices.

The present is a very ornamental species, and thrives moderately well under cultivation, if planted in sandy soil, well supplied with drainage material, so that water does not stagnate about the roots. Its shining evergreen appearance renders it exceedingly well adapted for the decoration of outdoor rockwork moderately shaded; and if planted in porous soil among stones in a north aspect, it will generally flourish, if the situation be one in which the atmosphere is tolerably pure. It does not like a smoky confined situation, and is therefore less frequently seen in a thriving state in town gardens. In the greenhouse or closed fernery, where the atmosphere is more completely under control, the plant assumes a very ornamental character, and both it and its varieties are to be recommended on

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account of the contrast which their dark shining green enduring fronds afford in a choice collection of living ferns. It is said not to thrive in the confinement of a close Wardian case. It may be increased by division of the crowns of the caudex. The variety *acutum* is more manageable than the common form of the species, under artificial conditions. Mr. G. Maw has observed the same habit, and remarks:—"I think *acutum* will be an easy and very desirable Fern to cultivate. In a cold frame it grows with me much more freely than *Adiantum-nigrum*, throwing up fronds all the year round."

The Black Maidenhair Spleenwort is met with under various phases, some of the varieties differing from the type forms in certain obvious and well marked characters, while others are only of secondary importance. We omit altogether, in this enumeration of them, the mere accidental furcation of the frond or of the pinnæ, which sometimes occurs:

1. *acutum* (Poll.). This is a plant of very distinct aspect, and those who prefer to separate it from *Asplenium Adiantum-nigrum* are perhaps correct in doing so; though as there are obviously connecting links, which, in a botanical point of view, indicate an exceedingly close affinity between the two, we prefer as the safest course to consider the one as an extreme variety of the other. The texture in *acutum* is firmer, *i. e.*, harder and less fleshy-coriaceous than in the usual states of *Adiantum-nigrum*, but forms of the latter occur which are not readily distinguishable in this respect. The caudex of *acutum* is short, stout, and tufted, like that of *Adiantum-nigrum*, with which the plant also agrees in being furnished at the crown and on the base of the elongated dark purplish-brown stipites with striately reticulated scales, lanceolate below and ending in a hair-like point. The fronds vary from about six to eighteen inches in length including the stipites, and are from about two and a half to seven or eight inches across the base of the leafy portion; in a fine Irish example before us, the leafy part is eight inches long and seven broad, and the stipes nine inches long. They are quite smooth, and in outline are sometimes deltoid, or perhaps more correctly pentangular, from the apices of the lowest posterior pinnules forming additional angles: sometimes ovate, with the point much attenuated;

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both these forms, though on a small scale, are shown in our Plate. The ovate attenuated form might be supposed to indicate a less mature condition of the plant, but this explanation we are scarcely prepared to adopt; for fronds equally small occur in which the pentangular outline is preserved, while again the ovate fronds are often abundantly fertile; it is perhaps rather an instance of that profusion of form, in Nature, which mocks at our specific definitions. The larger of the pentangular fronds are almost quadripinnate. The pinnæ, especially the lowest pair, which are opposite, and are also the largest, are nearly of the same outline as the frond itself, of which they are miniatures, excepting that as the pinnules are alternate and not opposite as the lower pair of pinnæ are, there is a degree of obliquity at their base which almost produces a trapeziform outline their apices, as well as that of the frond, and generally those of the pinnules also, are caudate, with a few sharp deep distant teeth. The larger pinnules of the lowest pinnæ are somewhat obliquely ovate with a long attenuated point, and their divisions, the secondary pinnules, are lanceolate, deeply pinnatifid at a very acute angle into linear erect lobes, the lower of which are about three-toothed, while those above them are bifid at their points, and those at the apex form simple teeth, which as well as the teeth of the lobes are narrow erect and acute. The pinnæ towards the apex of the frond, and the pinnules towards the apices of the pinnæ, become gradually narrower and less compound than these basal ones, until they are both reduced to linear-lanceolate sharply-toothed lobes, which latter gradually merge into the simple linear teeth of the caudate extremities. A similar mode of division, but on a smaller scale, obtains in the smaller forms, the fronds being only tripinnate, and the secondary pinnules narrower, and less deeply lobed. The veins, though slender, are very distinct; they consist of a series of furcations, that is to say, the vein which represents the midvein of the pinnules forks below each of the lobes or teeth, and the venule thus produced proceeds along the tooth or lobe until it nearly reaches the apex, being where the margin is toothed simple, and where it is lobed again forked once or twice according as there may be two or three apical teeth. The sori are very narrow, linear, borne as in *Adiantum-nigrum* contiguous to each other, and near the centre of the pinnules.

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The indusium is white, semi-transparent and entire. The plant is one of unusual elegance, both on account of its minute subdivision, and its smooth shining surface.

No one who has observed the venation in this plant, and is acquainted with our British *Aspleniæ*, can fail to notice the similarity in form and division and in the condition of the veins, that exists between some of its ultimate pinnules, especially the shorter and broader ones of the less divided fronds, and some of the fronds of *Asplenium septentrionale;* there is no definite midvein in either, but a series of furcations only. This plant alone furnishes sufficient evidence against the adoption of the *Amesium* or *Acropteris* group as a genus.

This acute variety differs from the normal form of *Adiantum-nigrum* in its more subdivided fronds, in which the deltoid form is usually strongly developed, in its thinner, harsher, and more papery texture, and in the presence throughout of linear acute erect segments and teeth. As to its distinctness, our enumeration of the varieties or forms occurring in Great Britain will show that in composition it is simulated by *decompositum;* in texture by *oxyphyllum* especially, and by *intermedium* in a considerable degree; and in the presence of linear segments or teeth, both by *oxyphyllum*, in which the teeth though sharp are short, and by *fissum* and *acutidentatum*, in which the narrow marginal divisions are, perhaps, rather monstrous developments of the teeth, than normally narrow divisions of the pinnules. These points of resemblance, however, and the occurrence of other foreign intermediate states, have determined us in retaining *acutum* as a variety of *Asplenium Adiantum-nigrum*. We have only seen true examples of this variety from Ireland, in which the following habitats are recorded:—Kerry: Turk Waterfall, Killarney, *Dr. Mackay*, *Dr. Allchin*, and others; foot of Cromaglaun near the lower end of the upper lake, *G. Maw;* above Blackstones, Glouin Caragh, Inveragh, *G. Maw;* Cahir Conree, a mountain near Tralee, *W. Andrews*. Dublin: Dublin mountains, 1854, *D. Orr*. Cork: near Garrycloyne, Blarney, 1857, *Miss Townsend*. Mr. C. Johnson, in *Sowerby's Ferns of Great Britain*, states that in 1821, he gathered a plant undistinguishable from this, on the walls of the Cathedral of St. Asaph in Wales; it has further been reported from

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Jersey on the authority of M. Piquet; and a specimen from Combe Royal, South Devon, sent by Miss Hoseason, approaches it very nearly. Sherard's plant from the Mourne Mountains in Down, the *Asplenium Adiantum-nigrum*, β. of Sir J. E. Smith, and identified with *acutum* by Mr. Newman, is not referrible here, but to *Athyrium Filix-fœmina* (*see* p. 37). Mr. Maw mentions that it prefers the drier parts of moist woods, occurring in situations where the tree-growth is not very dense. [Plate LXXII.]

2. *obtusatum* (M.). This may be considered as a less developed though matured condition of the species, than that which we have regarded as typical. It is a comparatively small and dwarf plant, and assumes an ovate-acuminate rather than a triangular outline; some specimens are not more than two inches high, and others very marked in character are six or eight inches high. The smaller specimens are scarcely bipinnate; the pinnæ are short and bluntly triangular; the pinnules are roundish-obovate, and very indistinctly toothed. The larger examples are tripinnate, with their primary and secondary pinnules corresponding with the pinnæ and pinnules of the small specimens. It is probably not uncommon, specimens from the three kingdoms being before us. This form is less defined than some others, the smaller states of the common form occasionally approaching it very closely, but as it occurs under different phases, it seems to claim recognition, at least as a variety of secondary importance. Thus, though often scarcely bipinnate, we have received from Mr. D. Moore specimens from Antrim, Ireland, which though tripinnate are clearly referrible here. The other specimens we have seen are from:—Kent: Sandgate, *S. O. Gray*. Devon: Torquay, *Miss E. Burmester*. Yorkshire: Wensleydale, *C. H. Compton*. Stirlingshire: near Stirling, *Mrs. Macleod*. Argyleshire: Ardrishiag, *T. M.* Ireland: Newtown Castle, *Dr. Allchin;* Foynes, *Mrs. Barrington;* foot of Slieve More, Dugort, Isle of Achill, *R. Barrington*. Guernsey, *G. Wolsey*. [Plate LXXI A.]

3. *leptorachis* (M.). This is a small-fronded elegant form remarkable for the length of its stipes and the small size of the parts of its frond. The stipes is about seven inches long, slender; the rachis also is slender; the leafy portion or lamina is about three inches long, ovate, shortly acuminate, tripinnate; the pinnæ alternate, the

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basal pinnules of the lowest ones broadly and bluntly ovate, and quite separated into small thinnish obovate-wedge-shaped pinnules, which are somewhat pinnatifid in the upper half, the lobes tipped with a pair of small acute teeth. The plant, which is abundantly fertile, was found in Glen Urquhart, in the Highlands of Scotland, by Miss McInnes.

4. *oblongum* (M.). The chief peculiarity of this form is the parallelism of the sides of its fronds, which thus become narrow oblong, like what occurs in *Lastrea spinulosa*. In a specimen before us, the length of the lamina is five inches, and the breadth below about two inches. The pinnæ are short, remarkably triangular, acuminate, ascending, the three or four lower pairs almost equal in size. The subdivisions are small, but otherwise the structure is normal. We have received it from Guernsey, where it was found by Mr. C. Jackson; and it has also been found by Dr. Allchin. [Plate LXXI B.]

5. *oxyphyllum* (M.). This variety, in its texture and the acuteness of its divisions, has a good deal of resemblance to that form of the true *acutum*, which has the fronds narrowly acuminate; its fronds, however, show a tendency to diminution rather than enlargement in the lower pinnæ. The plant is of moderate size; the pinnæ are short, very oblique from the enlargement of the basal anterior pinnule, the latter being more distinct and distant than the remainder, which become a good deal confluent; the teeth are deep, narrow, and conspicuously acute. It was found in 1855, near Dunoon, in Argyleshire, by Mrs. East, of Blackheath; and has been subsequently gathered near Stirling, by Mrs. Macleod. [Plate LXXI C.]

6. *variegatum* (Woll.). This exceedingly rare and beautiful variety has been found in Yorkshire, and also in Guernsey by Mr. Jackson. It is normal in every respect, excepting in being striped unsymmetrically with white; and it is sub-permanent, depending for its variegation, as Mr. Wollaston has observed, on the mode of culture adopted. It is quite different from the usual so-called variegations of this species, which for the most part are certainly caused by insect attacks, although one example, found by Mr. Silver on Shottisbrook Church, in Berkshire, has the appearance of actual

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variegation, being distinctly margined with yellowish white. As this latter does not, however, appear to have again been met with, we mention it only thus incidentally.

7. *acutidentatum* (M.). A large form with caudate divisions, and prominent acute teeth, having much resemblance to *acutum*, but the pinnæ are narrower, and the lobes of the pinnules are broader. The pinnules are ovate-lanceolate, deeply pinnatifid, the lobes being narrowly oblong-cuneate, notched principally at the ends with linear acute teeth. The sori are crowded in the centre of the pinnules. It has been found at Ilfracombe, in Devonshire, by the Rev. J. M. Chanter; and in Somersetshire, near Nettlecombe, by Mr. C. Elworthy. [Plate LXXI E.]

8. *fissum* (M.). This is a large growing plant, the fronds broadly ovate or pentagonal, sometimes oblong or ramose or irregular in development. The more perfect fronds are tripinnate at the base of the pinnules, which become more or less confluent in the upper parts, as are the pinnæ. The pinnules are large and coarse, but with a very irregular development and a narrowed or wedge-shaped character below, more or less lobed upwards, the lobes unequally cut into long narrow acute teeth. The sori, which are plentiful and much elongated generally, are in some cases on the confluent portions in the upper part of the pinnæ fully half-an-inch long. It is altogether a remarkably sportive plant, very inconstant to any precise form, though retaining the same general characters. The fronds are often more or less caudate; the pinnules abnormal-looking, and irregularly cut into long linear acute entire segments or lobes, answering to the acute teeth of the usual states of the plant; some of the pinnules may be said to be palmately-laciniate. We have received this form from: Miss Hoseason, who gathered it at Combe Royal, near Kingsbridge, in South Devon; from the late Mr. Ingpen, who obtained it of a London hawker; and the more irregular form from Mr. Clapham, who had received it as a garden plant under the name of *obtusum*. [Plate LXXI D.]

9. *incisum* (Claph.). A dwarf ovate or ovate-triangular tripinnate form. The pinnæ are short and broad, nearly deltoid in outline; the larger pinnules nearly of the same form, but proportionately smaller, cut into three segments or secondary pinnules, of

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which the two lateral ones are obovate-wedge-shaped, cut into numerous long acute teeth at the apex, and the centre one is larger and somewhat lobate as well as toothed. In some fronds the parts are smaller, and the pinnules are more ovate, with several segments, the lower of which are three-cleft. In other cases the long, acute teeth appear like a fringe to the divisions of the frond. It was found at the Bridestones, near Snainton, Yorkshire, by Mr. Thompson, and was communicated by Mr. Clapham.

10. *intermedium* (M.). The fronds of this variety are of large size and lax habit, these features being coincident with an elongation of the parts, and a thin though firm texture of the fronds. It has often been wrongly associated with *acutum*, from which it differs in having more elongated and less compound fronds, and in the greater breadth of their ultimate divisions. The pinnæ and the fronds are caudate; the pinnules elongated and acuminate, but there are no linear segments of the pinnules. It seems to bear about the same degree of relation to the normal state as *obtusum*, but in an opposite direction, and we enumerate it as a variety, merely in order to point out the steps by which the more usual state of the plant, approaches the distinct-looking acute form. We have received it principally from the West of England, Ireland, and the Channel Isles, namely:—Devonshire: Barnstaple, *C. Jackson;* Ilfracombe, *J. Dodds;* Ottery St. Mary, *G. B. Wollaston.* Somersetshire: Nettlecombe, *Sir W. C. Trevelyan.* Kent: Sandgate, *S .O. Gray.* Dumfries-shire: Moffat, *J. Anderson.* Dublin: Hill of the Grange, *R. Barrington.* Limerick: Ballywilliam, *Mrs. Barrington.* Antrim, *D. Moore.* Guernsey, *C. Jackson.* Jersey, *C. Jackson.*

11. *decompositum* (M.). This, like *acutum*, is almost or even quite quadripinnate, and may be briefly described as resembling that variety in the form of its fronds and pinnæ, and even pinnules, but the ultimate parts, though narrow, are blunt, as if rounded off, not acute as in that, and the texture is more coriaceous. The divisions, moreover, although small and comparatively narrow, are not so much narrowed as in *acutum;* and the absence of linear segments, and the bluntness of the few teeth that are apparent, readily distinguish it from that variety. We have received it from

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the Rev. J. M. Chanter, who found it at Manaton in Devonshire. It is the same as the *Asplenium silesiacum* of Milde.

12. *microdon* (M.). This is quite distinct from all other forms, and like the variety *microdon* of *Asplenium lanceolatum* does not, at first sight, appear to belong to the species to which it is referred: both these plants rather resemble *Asplenium marinum*, with which, however, they do not agree in any essential particular. The present when young was referred to the above-named variety of *lanceolatum*, as a somewhat deltoid form, but now that it has become mature, its fructification sufficiently separates it. The fronds are six or eight inches high, broadest at the base, where they measure nearly three inches across, pyramidal or elongate-deltoid with an irregular outline resulting from the unequal length of the pinnæ; they are pinnate at the base, the pinnæ being there distinct, but they become slightly adnate and decurrent above, and in the upper part are quite confluent into a broad irregular pinnatifid apex. The outline of all the distinct pinnæ is more or less hastate, the base being produced into a rounded auricle both on the anterior and posterior sides; this is most so in the lowest pinnæ, in which the auricles become lobes divided half way down to the costa; the base of these lower pinnæ is thus somewhat cordate-hastate, whilst above the auricle they taper off to an acute point and acquire a pyramidal figure. The margin is everywhere minutely and sharply denticulate. The most developed form we have seen, has two or three rounded lobes, besides the basal one, on each side the pinnæ. The sori are numerous, elongate, placed near the costa, very frequently scolopendrioid, sometimes diplazioid. This remarkable plant has been found in Guernsey by Mr. C. Jackson, and in Devonshire by the Rev. J. M. Chanter, and more recently in the neighbourhood of Barnstaple, by Mr. Jackson.

13. *depauperatum* (M.). The only examples we have seen of this form are dwarf, not more than two inches high; and the parts are all diminutive and irregularly depauperated. It was found in Westmoreland, on Whitbarrow, by Mr. F. Clowes.

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THE SEA SPLEENWORT.

ASPLENIUM MARINUM.

A. fronds linear or linear-lanceolate, tapered above, pinnate; pinnæ trapezoid-oblong, oblique, shortly stalked, the margin serrate unequally crenate or lobate, rarely pinnatifid, the anterior base truncate and sub-auriculate, the posterior cuneate; upper pinnæ confluent; sori large, oblique, near the midrib; rachis and petiole winged. [Plate LXXIII.]

ASPLENIUM MARINUM, *Linnæus, Sp. Plant.* 1540. *Bolton, Fil. Brit.* 26, t. 15. *Smith, Eng. Bot.* vi. t. 392; *Id., Eng. Fl.* 2 ed. iv. 294. *Hooker, Fl. Lond.* iv. 57, t. 60. *Deakin, Florigr. Brit.* iv. 69, fig. 1592. *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Mackay, Fl. Hib.* 341. *Babington, Man. Brit. Bot.* 4 ed. 426. *Moore, Handb. Brit. Ferns,* 3 ed. 177; *Id., Ferns of Gt. Brit. Nature Printed,* t. 38. *Newman, Hist. Brit. Ferns,* 3 ed. 235. *Bentham, Handb. Brit. Fl.* 632. *Sowerby, Ferns of Gt. Brit.* 50, t. 29. *Schkuhr, Krypt. Gew.* 64, t. 68 (excl. fig. *c.*) *Willdenow, Sp. Plant.* v. 318. *Sprengel, Syst. Veg.* iv. 83. *Presl, Tent. Pterid.* 107. *Link, Fil. Sp.* 93. *Mettenius, Fil. Hort. Bot. Lips.* 73; *Id., Asplen.* 135. *Fée, Gen. Fil.* 190. *Heufler, Aspl. Eur.* 14. *Lowe, Nat. Hist. Ferns,* v. t. 23. *Nyman, Syll. Fl. Europ.* 432.

ASPLENIUM LÆTUM, *Hort. Lowe, Nat. Hist. Ferns,* v. t. 21 A.

ASPLENIUM TOVARENSE, *Hort.*

Var. **trapeziforme**: pinnæ shorter, trapezoid-ovate, the upper base truncately-rounded not auricled, toothed; the lower ones deflexed.

ASPLENIUM MARINUM, *v.* MINOR, *Link, Fil. Sp.* 93. *Moore, Index Filicum,* 144.

ASPLENIUM MARINUM, *Schkuhr, Krypt. Gew.* t. 68, fig. *c.*

ADIANTUM TRAPEZIFORME, *Hudson, Fl. Ang.* ii. 460, according to Smith, Bolton, etc.; but Hudson describes his plant as "supradecompound."

Var. **assimile**: pinnæ elongate, linear oblong, crenately auricled and truncate at the base, narrowed upwards, deeply and distantly lobed, the lobes directed forwards, crenately-toothed; pinnæ sometimes conspicuously auriculate.

ASPLENIUM MARINUM, *v.* ASSIMILE, *Moore, Ferns of Gt. Brit. Nature Printed,* under t. 38; *Id., Handb. Brit. Ferns,* 3 ed. 180; *Id., Index Fil.* 144.

Var. **acutum**: pinnæ elongate, linear oblong, auricled and trun-

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cate at the base, narrowed to an acute point, crenate or crenately sublobate, with sparingly toothed segments. [Plate LXXIV D.]

ASPLENIUM MARINUM, *v.* ACUTUM, *Moore, Ferns of Gt. Britain, Nature Printed,* under t. 38; *Id., Handb. Brit. Ferns,* 3 ed. 179.

Var. **incisum**: pinnæ small, short, obliquely oblong-obtuse, with a few coarse deep lobes, the lobes obscurely toothed. [Plate LXXIV A.]

ASPLENIUM MARINUM, *v.* INCISUM, *Moore, Handb. Brit. Ferns,* 3 ed. 180.

Var. **ramosum**: pinnæ obliquely ovate or triangular, subhastate below, sublobate or coarsely crenated, the crenatures obscurely toothed; stipites usually two branched or united in pairs at or near the base. [Plate LXXIII *bis*, B.]

ASPLENIUM MARINUM, *v.* RAMOSUM, *Wollaston MS. Moore, Ferns of Gt. Britain, Nature Printed,* t. 38 H; *Id., Handb. Brit. Ferns,* 3 ed. 179.

Var. **sub-bipinnatum**: pinnæ obliquely ovate-lanceolate, the central ones almost again pinnate at their base, deeply pinnatifid throughout; anterior basal lobes oval, acute, obscurely serrate. [Plate LXXIV E.]

ASPLENIUM MARINUM, *v.* SUB-BIPINNATUM, *Moore, Ferns of Gt. Britain, Nature Printed,* under t. 38; *Id., Handb. Brit. Ferns,* 3 ed. 177; *Id., Index Filicum,* 144.

Caudex tufted, erect or decumbent, densely scaly. *Scales* dark brown, shining, striately venose, lanceolate, extending into a long hair-like point. *Fibres* branching, numerous.

Vernation circinate.

Stipes shorter than the frond, smooth, channelled in front, chestnut-coloured or purplish-brown; terminal and adherent to the caudex. *Rachis* margined and more or less coloured brown below, winged and green above.

Fronds averaging from six to twelve inches long, including the stipites, sometimes shorter, occasionally longer, rarely upwards of a yard long; smooth, coriaceous, broadly linear tapering to the apex,

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pinnate. *Pinnæ* oblong oblong-ovate or linear, oblique, the anterior basal angle being most produced, obtuse, often nearly equal in width throughout, usually about an inch in length; the anterior base truncately rounded, and forming a blunt more or less apparent auricle, the inferior base cut away obliquely in a wedge-shaped manner. The lowest pinnæ are stalked, with the stalks winged; but the upper ones become decurrent, and at length confluent into a tapering pinnatifid apex. The margins are doubly crenato-serrate, the serratures unequal, sometimes deeper forming evident lobes.

Venation consisting of a prominent flexuous *costa* or midvein from which branch out the forked *veins;* the lowest anterior vein is two or three times forked, while the rest are usually once forked only; the *venules* terminate abruptly within the margin, the anterior ones generally bearing the sori.

Fructification spread over the back of the frond. *Sori* linear, oblique, indusiate, borne on the anterior side of the venules (except sometimes on those of the auricle, when two or more sori are borne by the same fascicle of veins), commencing on each side near the costa, and forming two series of short divergent lines along each pinna. The sori, though consisting of a profusion of spore-cases, are commonly distinct, though they sometimes coalesce so as to cover the whole under surface. *Indusium* of the same form, persistent, entire. *Spore-cases* numerous, globose, brown. *Spores* ovate, angular.

Duration. The caudex is perennial. The fronds being persistent, and the young ones each year produced long before the old ones decay, the species is truly evergreen.

This is a well marked species, distinguished from the other simply pinnate British *Asplenium*s by its winged rachis, and by its greater size and more coriaceous texture. This latter feature gives to it an aspect of massiveness as compared with its size, by which it may be known at first sight.

This plant occurs in clefts and caves of rocks, and often abundantly, on all our coasts, with the exception of those of the eastern side of England, and is essentially a maritime species. It is most

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profuse in the south-west of England and in Wales; thence spreading, but diminishing in frequency, eastwards as far as Sussex, and northwards to Orkney, from which latter point it passes, occurring here and there, along the eastern side of Scotland to Yorkshire. It is found also in the Hebrides, and is abundant on the Irish coasts, and in the Channel Islands. We have received specimens of the variety we have called *parallelum*, from Guernsey, gathered by M. Boistel, measuring thirty-four inches in length, of which twenty-four inches were occupied by about thirty pairs of pinnæ, the largest of these being about two inches and a half long, and three-eighths of an inch wide: larger specimens were produced on the same plant, which was growing without soil on a damp rock! Though a maritime plant, it is found in a few cases inland, as at Newton, and in the neighbourhood of Warrington, in Lancashire; and again on the side of Cromaglaun Mountain, Killarney. It probably does not attain any considerable altitude above the coast level. The records of its distribution are these:—

Peninsula.—Cornwall: Whitsand Bay, *F. H. Goulding;* St. Ives, *Miss Warren;* Lamorran; and the Cornish coast generally. Devonshire: Plymouth; Dawlish, *Miss Griffiths;* Ilfracombe, *R. Withers;* Salcombe; Torquay; Stoke Gabriel; Babbicombe; Teignmouth; Linton, *N. B. Ward;* Lynmouth, *Rev. T. Rooper;* Valley of Rocks, and Lee Abbey, *T. Clark;* Georgeham, *Rev. F. Mules;* Marwood, *Rev. F. Mules;* and other parts. Somersetshire: Clevedon; Portishead; Selworthy, *Mrs. A. Thompson;* Weston-super-Mare, *T. Clark.*

Channel.—Isle of Portland. Dorsetshire: Purbeck, *Pulteney;* Lyme Regis. Isle of Wight, beyond Knowle, towards Blackgang, *Miss Kirkpatrick.* Sussex: Castle Rock, Hastings, *Ray.*

Severn.—Gloucestershire, *Fl. Brit.*

Mersey.—Cheshire: Red Noses Rocks, New Brighton, *E. Newman;* Black Rocks at the mouth of the Mersey, *H. C. Watson;* Hilbre Island, mouth of the Dee, *Dr. Wood.* Lancashire: Winwick or Hulme stone-quarry, near Warrington, *Bolton* (inland); red sandstone rock, Newton (inland); Knot's Hole, Dingle, *S. Thompson;* Black Rock, near Liverpool; rocks near Heysham.

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Humber.—Yorkshire: Cloughton Bay, *A. Clapham;* cliffs north of Scarborough.

Tyne.—Durham: Marsden Rocks, *R. B. Bowman;* Black-hall Dean, west of Hartlepool, *Rev. J. Dalton;* near Southwick; Teesdale. Holy Island. Northumberland: Howick, *T. Wilcke;* rocks near Craster, *Rev. R. Taylor.*

Lakes.—Westmoreland: sea-cave near Silverdale. Cumberland: Whitehaven, *A. Clapham;* St. Bee's Head, *Rev. G. Pinder.* North Lancashire: Head of Morecambe Bay. Isle of Man, *W. Wilson.*

S. Wales.—Glamorganshire: rocks by the Mumbles Lighthouse; between the Mumbles and Penyard Castle; Swansea; Dunraven; Neath; Oystermouth; Bacon's Hole; coast of Gower, *R. Withers;* Barry Island, etc. Pembrokeshire: cliffs between Tenby and Saundersfoot, *R. Kippist;* Fishguard, *W. Hutchison;* St. David's; St. Catherine's Island, etc. Cardiganshire: Aberystwith Castle, *E. Newman;* and elsewhere.

N. Wales.—Anglesea: Llanddwyn; Traeth Loch, *J. E. Bowman;* South Stack Lighthouse, Holyhead, *C. C. Babington;* Priestholm Island, *Ray.* Merionethshire: Towyn. Carnarvonshire: Eagle Tower, Carnarvon Castle, *Rev. G. Pinder;* cliffs near Pigeon's Cave, Great Orme's Head, *T. Baxter;* Bangor, *W. Wilson.*

W. Lowlands.—Kirkcudbrightshire: Southwick Cliffs; Colvend Cliffs, *P. Gray.* Wigtonshire: Port Patrick, *Dr. Balfour.* Ayrshire.

E. Lowlands.—Berwickshire: near Eyemouth, *Rev. A. Baird;* Rammel Cove; rocks by the Tweed, below Lady-Kirk House, seven miles from the sea; and on the whole of the coast, *Dr. G. Johnston.* Edinburghshire: near Queensferry.

E. Highlands.—Fifeshire: Wemyss, and elsewhere on the coast. Forfarshire: Red Head, *A. Croall;* rocks and caves east of Auchmithy, *Dr. G. Lawson;* Montrose; Dysart. Kincardineshire: cave at Cove, three miles S. of Aberdeen—small, resembling the Killarney plant, *G. Maw.* Aberdeenshire. Morayshire, *Rev. G. Gordon.*

W. Highlands.—Argyleshire: Oban, *E. Newman.* Isles of Bute, Arran, Islay, Mull, Cantyre, Jura, Staffa in vertical fissures of the basalt, Iona, and Skye. Ailsa Craig.

N. Highlands.—Ross-shire: Nigg. Sutherlandshire: Farr. Caithness: rocks near Wick; near Thurso, *T. Anderson.*

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N. Isles.—Orkney: Hoy and Mainland, *T. Anderson*, who found it growing on the inside of St. Magnus' Cathedral, from whence it is now eradicated by repairs.

W. Isles.—Little Barve, Harris. Shiant Isles.

Ulster.—Down: Newcastle, *W. Thompson.* Isle of Rathlin. Cavan: Mullaghmore.

Connaught.—Abundant along the coast, *Dr. Mackay.* Galway: Connemara. Arran Isles, *D. Oliver, Jun.*

Leinster.—Dublin: Hill of Howth; Killiney Bay, *G. Lloyd.*

Munster.—Abundant along the coast, *Dr. Mackay.* Kerry: Killarney, *E. Newman* (inland); Derrynane; near Dingle, *R. Barrington.* Cork: rocks on south coast; Clonmel, *J. Sibbald.*

Channel Isles.—Guernsey: Petit Bot Bay; Torteral, *Rev. Mr. Dobree;* north and east coast; occurring also on an inland church two miles from the sea, *C. Jackson.* Jersey, *J. Piquet.*

This littoral and rupestral species is in Europe most abundant in the western part, occurring in Great Britain, Ireland, Spain, Portugal, France, Corsica, and Italy, extending, however, eastward to the Mediterranean, since it is found in the Balearic and the Ionian Isles. From Spain it crosses to Barbary and Tangiers, on the African coast; and it is again found in Madeira, the Azores, and the Canaries. More southward it appears in St. Helena, according to a specimen in the Hookerian Herbarium, and also according to Heufler, on the authority of the younger Jacquin's collection. Sir W. Hooker's Herbarium also contains specimens marked as having been brought from New Holland and Rio Grande, together with others of small size from New Brunswick, and similar ones from North America, not specially localised. The figure of Plukenet, usually quoted for this plant, and if correctly so, giving it a West Indian habitat, may equally be taken for *Asplenium dentatum.* The distribution of this species, Mr. Johnson observes,* extending from the north of Africa and the Canaries and Madeiras, along the shores of Spain and France, and its absence from other parts of Europe apparently well authenticated, is a curious geographical phenomenon, pointing to a probability of its having taken place

* Sowerby, *Ferns of Gt. Brit.* 52.

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prior to the great disruption of the chalk and the vast deposit of alluvial matter along the eastern coast of England; especially when added to the fact of its sparing occurrence in Hampshire and Sussex, and to its non-existence throughout the former line of connection between this country and the continent, and even beyond this northward to Flamborough Head.

This species is easily cultivated in sheltered situations, as in a frame or greenhouse, and thrives remarkably in a moist stove. It does not bear frost or exposure, and we have found it to be destroyed by being frozen, even when kept in a close greenhouse. Few of the smaller Ferns are more ornamental, or more deserving of cultivation than the Sea Spleenwort. Its fronds, owing to their thick leathery substance, are long-enduring, and they are moreover of a deep shining green; and thus, with very little care, may be kept clean and bright, a state which tends greatly to the preservation of the health of a cultivated plant, and always adds immeasurably to its beauty and to the interest which it excites. Hence, for a shady greenhouse, no Fern can be more appropriately chosen; while, even for very sheltered situations out-doors, especially in localities near the sea, the same qualities recommend it.

We may take this opportunity to state generally the kind of treatment which has been found to suit the small evergreen Ferns of this character when under pot culture. The pots in which they are planted should be of moderate size compared with the plant, that is, their diameter should exceed by two or three inches only, the breadth of the crown or mass of the caudex. The plants grow well either in a soil of turfy peat and silver sand, with a small proportion of friable yellow loam, and liberally intermixed with small nodules or fragments of sandstone or porous brick, or in a mixture of which sandy fibrous loam forms the staple, and in which the hard porous materials are also blended. In either case, the bottom of the pots must have a good layer of these latter materials for drainage. The crown should be kept rather above the surface of the soil, and is perhaps best set between two or three larger somewhat raised pieces of stone or brick. The soil, which in potting should always be used when neither wet nor dry, but just equally moistened so as to be friable,

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not adhesive, should be made firm about the roots, because it is then less subject to alternations of moisture. Unless the pots become filled with roots, so that more nourishment is required by the plants—and this is generally evidenced by the soil in the pots drying rapidly compared with others not so circumstanced—the less the soil or the plant is disturbed the better, so long as both continue in a free healthy state. If the soil becomes soddened with water, as sometimes happens from the drainage becoming choked, either through careless watering, or from the plants standing under a drip, then the plants should be repotted, so as to rectify the evil. No Ferns, on the other hand, like to be kept dry at the root; but they should have such supplies of water as will keep the soil just moistened thoroughly. A moderately damp and rather shady situation is most congenial to the growth of the fronds; no situation can be more suitable than a close cold shady frame or pit, from which frost is just excluded. The plants increase with tolerable facility by division.

When obtained from their wild localities, the roots of Ferns growing like the Sea Spleenwort in rocky situations, are often much damaged in detaching the plants from the rocks to which they cling, and under such circumstances they require some care to get them established. It is better in cases of this kind to choose small compact plants in preference to larger ones. Once established, they grow readily, and may then be increased by dividing the crowns at the time of repotting, which is we believe, in all cases best done in spring.

There are some very curious and interesting variations of this plant now known. The thick substantial deep green blunt crenately toothed pinnæ of the normal forms, give place to others which become narrowed and tapering, or deeply lobed, or in one instance almost bipinnate :—

1. *trapeziforme* (Claph.). This is supposed to be the same as the var. *minor* of Link, and also the plant called *Adiantum trapeziforme* by Hudson. It is a permanent dwarfish variety compared with some other forms, and is of robust habit. The fronds are leathery in texture, dark-green; the pinnæ are short, rounded, but scarcely

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auricled at the truncate anterior base, the lower ones deflexed, trapeziform, the rest often imbricated, and usually crenately toothed. It has been found in—Yorkshire: Cloughton Bay, Scarborough, *A. Clapham.* Devonshire: Salcombe, near Kingsbridge, *T. G. Carter;* Hance's Cove, Torquay, *C. Smith.* Cornwall: St. Just, *G. Maw.* Down: Newcastle, *Macreight.*

2. *pulchrum* (M.). This is a small form approaching *ramosum* (5) in appearance, but is a less marked variety, though a neat and pretty plant. The fronds are small, varying from about four to six or eight inches high; the pinnæ short, oblong obtuse, truncate and slightly auricled in front, cuneate behind, the margin doubly crenate, and in the best examples sub-lobate from the depth of the primary crenatures. It is its dwarfishness, together with the lobate character it assumes, which gives its distinctive features to the variety. It was found on the rocky banks of the Dart, near Totnes, by Mr. C. Scott. [Plate LXXIV F.]

3. *cuneatum* (M.). This form is peculiar from the absence of the truncate auriculiform projection usual at the anterior base of the pinnæ, the base being acutely but obliquely wedge-shaped. The pinnæ are oblong, obtuse, about an inch long, less coriaceous than usual, and cut along the margins with deep sharp uneven serratures, so as to become unequally biserrate. It was found by Dr. Allchin at Black Head, Clare, Ireland; but we are not aware that its constancy has been tested by cultivation.

4. *crenatum* (M.). This form is remarkable for its short, obtuse, oblique, trapeziform pinnæ, and for the small even deep roundish crenatures, by which it is notched around the margin. In the general outline of its pinnæ, it resembles *ramosum*, but the toothing of the margin is altogether different. The plant was originally found in Hulme stone quarry, Winwick, near Warrington, Lancashire, and specimens have been communicated by Mr. T. G. Rylands. [Plate LXXIII *bis*, A.]

5. *ramosum* (Woll.). This is a very marked variety. One of its chief peculiarities is that the fronds are branched, which branching takes place sometimes in the rachis, but more frequently at the base of the stipes, so that the fronds become united in pairs, the junction often taking place before they separate from the caudex, so that

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two fronds appear to grow side by side from one point. The pinnæ are, moreover, remarkable in their form and appearance, and give the plant a very distinct aspect; the lower ones are bluntly three-cornered and nearly equal-sided, while upwards they are narrower so as to become more ovate, and they are also more oblique; they have usually a large rounded anterior auricle, and frequently the posterior base also bears a large rounded lobe; these pinnæ are somewhat undulated, coarsely crenate-lobate, with the lobes indistinctly crenate-toothed. The sori are abundant, and prominent. This rare and thoroughly constant form, was found in 1850 by Mr. Wollaston, in Dorsetshire. [Plate LXXIII *bis*, B.]

6. *incisum* (M.). This is a small and elegant form, remarkable for the deep and uneven incisions in the margin of its pinnæ. The same form is figured by Dr. Deakin,* but no habitat or description is given; the specimen however is represented about seven inches in length, exclusive of the stipes, and having about sixteen pairs of distant pinnæ. The examples we have seen are much smaller than this. The pinnæ are short, scarcely more than half an inch long, very obliquely semi-ovate, truncate and auricled at the anterior base, and with about three deep incisions along the anterior margin, blunt ended, the posterior side narrow, with a few deep lobes, and sloping off in a wedge-shaped manner at the base. A few large sori are produced chiefly at the anterior edge of the lobes, which lobes are all obscurely toothed. We have seen specimens from Carnarvonshire: Great Orme's Head, *A. Stowe*, communicated by Mr. C. Griffith; and Denbighshire: near Llangollen, communicated by the Rev. T. Rooper. [Plate LXXIV A.]

7. *parallelum* (M.). A large form, growing about three feet long, the pinnæ somewhat distant, but occupying two feet of that length. The pinnæ are from two to two and a half inches long, and less than three-eighths wide, nearly parallel-sided, the base wedge-shaped, the margin coarsely but not deeply crenate-serrate, and the apex bluntish. It was found in Guernsey by M. Boistel. A somewhat similar plant, but having a ramose tendency in the rachis, has been found in Cornwall, by Mr. Atkins. [Plate LXXIV C.]

* Deakin, *Florigraph. Brit.* iv. 70, fig. *a*.

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8. *acutum* (M.). This is a large growing variety, remarkable for its elongated and acute-pointed pinnæ. The fronds are from one to two feet long, distantly pinnate, and lax. The pinnæ average about an inch and a half in length, and are broadest at the base, where they are truncate; they are auricled on the anterior, cuneate on the posterior side, and narrow gradually towards the apex, which is sharp-pointed, the margin being crenate, or sometimes doubly crenate. Considerable variety in texture, outline, and toothing occurs, and the pinnæ are sometimes straight, sometimes falcate. This form has been found in—Guernsey, and Jersey, *C. Jackson*. Devonshire: Plymouth Hoe, *J. Bauker;* Dartmouth Castle; Croyde, *J. R. Chanter*. Some fronds from the latter habitat, are remarkably narrow in the pinnæ, tapered both to the base and apex, biserrate or in some places lobed with the lobes serrate, and sometimes branched in the rachis. [Plate LXXIV D.]

9. *assimile* (M.). This form has acute elongated pinnæ similar to those of *acutum;* and these pinnæ are either divided along the margin into coarse deeply separated rounded crenately-toothed lobes, or are somewhat less deeply lobed, and more strongly auriculate. In the former case, the pinnæ resemble those of the Australasian *Asplenium caudatum*, and in the latter the West Indian *Asplenium auritum*. The fronds are a foot or more in length; and the pinnæ are often two inches long, gradually narrowing from the truncately-auricled, somewhat cuneate base; the marginal lobes are separated by acute open sinuses. It occurs in two or three forms in the Channel Islands, but the most strongly marked specimens we have seen, resembling *Asplenium caudatum*, were from Galway. It may be considered as a deeply lobed condition of the var. *acutum*.

10. *sub-bipinnatum* (M.). This is the most divided and distinct variety of this species yet discovered. The fronds are of moderate size, the largest we have seen being about seven inches long, and two and a half inches broad. The pinnæ, which are distinct, and stand more distant from the rachis than usual, having a somewhat obliquely cuneate base, are deeply pinnatifid throughout; the basal anterior lobes, which are the largest, are almost separated down to the costa, and these lobes are of a narrow oval outline, obscurely serrated on the margin. The other lobes are shorter, but narrow,

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as well as deeply divided and with open spaces between them. In cultivation, the plant though dwarfish, retains the same character, and no fructification has yet been observed. It was found in a cave at Petit Bot Bay, Guernsey, by Mrs. Dobree, of the Forest, Guernsey, and was sent to us by Mr. C. Jackson; a similar form, from Cornwall, has also been sent to us by the late Mrs. Delves. [Plate LXXIV E.]

11. *ramo-trapeziforme* (Claph.). This is a beautiful dwarf variety of multifid or abnormal character. The fronds communicated to us, are from two to three inches high, and branched either at the top of the stipites, or half-way up the rachides, or near to the apex, the pinnæ being small and roundish-trapeziform, here and there lobate, but usually sharply toothed. One frond dividing at the top of the stipes, has one of its branches dichotomously forked, and the other twice dichotomous. Another divided only near the apex, separates into four lance-shaped spreading divisions. The most marked example has the rachis divided about two-thirds up; below the ramification are placed about eight small pinnæ; the rachis then separates into five branches of an inch or more in length, forming a spreading apex to the frond, two and a half inches broad, each branch resembling the tip of an ordinary frond, and one of the branches being forked. The plants though small, are fertile. This extremely interesting variety was found by Mr. A. Clapham, at Burniston, near Scarborough, Yorkshire.

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THE COMMON MAIDENHAIR SPLEENWORT.

ASPLENIUM TRICHOMANES.

A. fronds linear pinnate; pinnæ roundish-oblong, roundish-ovate, or obovate, scarcely stalked, obliquely cuneate at the base, crenated; rachis dark brown throughout, bluntly keeled behind, and having a narrow erect membranaceous (not herbaceous) brown border in front; sori distant from the midrib. [Plate LXXV.]

ASPLENIUM TRICHOMANES, *Linnæus, Sp. Plant.* 1540. *Bolton, Fil. Brit.* 22, t. 13. *Smith, Eng. Bot.* viii. t. 567; *Id., Eng. Fl.* 2 ed. iv. 202. *Hooker, Fl. Lond.* v. 150, t. 156. *Babington, Man. Brit. Bot.* 4 ed. 426, incl. β. *Bentham, Handb. Brit. Fl.* 632 (excl. *A. viride*). *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Newman, Hist. Brit. Ferns,* 3 ed. 249. *Mackay, Fl. Hib.* 341. *Deakin, Florigr. Brit.* iv. 73, fig. 1594. *Moore, Handb. Brit. Ferns,* 3 ed. 181; *Id., Ferns of Gt. Brit. Nature Printed,* t. 39; *Id. Ind. Fil.* 173. *Sowerby, Ferns of Gt. Brit.* 52, t. 30. *Schkuhr, Krypt. Gew.* 69, t. 74. *Willdenow, Sp. Plant.* v. 331. *Sprengel, Syst. Veg.* iv. 85. *Link, Fil. Sp.* 89. *Flora Danica,* t. 119. *Svensk Bot.* t. 131. *Sadler. Fil. Hung.* 25. *Koch, Syn.* 2 ed. 982. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 521. *Presl, Tent. Pterid.* 108. *Fée, Gen. Fil.* 190. *A. Gray, Bot. North. United States,* 627. *Mettenius, Fil. Hort. Bot. Lips.* 72; *Id., Asplen.* 138. *Lowe, Nat. Hist. Ferns,* v. t. 22. *Heufler, Aspl. Europ.* 34. *Nyman, Syll. Fl. Europ.* 432. *Pappe & Rawson, Syn. Fil. Afr. Aust.* 19.

ASPLENIUM ADIANTUM-NIGRUM, *Lumnitz, Fl. Poson.* 1020; according to Sadler.

ASPLENIUM DICHROUM, *Kunze MS. Presl, Tent. Pter.* 108.

ASPLENIUM ELACHOPHYLLUM, *F. Mueller MS. in lit. et Hb.*

ASPLENIUM MELANOCAULON, *Willdenow, Enum.* 1072; *Id., Sp. Plant.* v. 332. *Sprengel, Syst. Veg.* iv. 86. *Presl, Tent. Pterid.* 108. *Link, Fil. Sp.* 90. *Fée, Gen. Fil.* 192.

ASPLENIUM MICROPHYLLUM, *Tineo, Guss. Fl. Sic. Syn.* 884.

ASPLENIUM NEWMANI, *C. Bolle, Bonplandia,* vii. 106.

ASPLENIUM SAXATILE, *Salisbury, Prod.* 403. *Gray, Nat. Arrang. Brit. Pl.* ii. 13.

ASPLENIUM TRICHOMANOIDES, *Weber and Mohr, Deutschl. Krypt. Gew.* 40. *Withering, Bot. Arrang. Veg.* 653. *Lightfoot, Fl. Scot.* 662.

TRICHOMANES CRENATA, *Gilibert, Exerc. Phytol.* ii. 556.

PHYLLITIS ROTUNDIFOLIA, *Mœnch, Method.* 724.

Var. **incisum**: pinnæ deeply pinnatifid, the segments narrow, inciso-serrate; barren. [Plate LXXVI.*bis*, A.]

ASPLENIUM TRICHOMANES, *v.* INCISUM, *Moore, Ferns of Gt. Brit. Nature Printed,* t. 39, D, E.; *Id., Handb. Brit. Ferns,* 3 ed. 181.

ASPLENIUM TRICHOMANES, β, *Smith, Eng. Fl.* 2 ed. iv. 292.

ASPLENIUM TRICHOMANES, *v.* PINNATIFIDUM, *Opiz;* according to Heufler.

ASPLENIUM SAXATILE, β. INCISUM, *Gray, Nat. Arrang. Brit. Pl.* ii. 13.

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Var. **subæquale**: pinnæ oblong, deeply and irregularly crenate, sometimes repand or sinuate, attached at or near the centre of the subequal base. [Plate LXXVI B.]

ASPLENIUM TRICHOMANES, *v.* SUBÆQUALE, *Moore, Ferns of Gt. Brit. Nature Printed*, under t. 39; *Id., Handb. Brit. Ferns*, 3 ed. 184.

Var. **cristatum**: fronds symmetrically multifid-crisped at the apex, not ramosely-divided below. [Plate LXXVI *bis*, D.]

ASPLENIUM TRICHOMANES, *v.* CRISTATUM, *Wollaston MS. Moore, Ferns of Gt. Brit. Nature Printed*, t. 39 H.; *Id., Handb. Brit. Ferns*, 3 ed. 183.

Var. **multifidum**: fronds bi-tri-chotomously divided below, the apices of the branches multifid-crisped. [Plate LXXVI *bis*, B.]

ASPLENIUM TRICHOMANES, *v.* MULTIFIDUM, *Moore, Ferns of Gt. Brit. Nature Printed*, t. 39 G.; *Id., Handb. Brit. Ferns*, 3 ed. 183.

Var. **ramosum**: fronds bi-tri-chotomously divided below, the branches flat normally taper-pointed. [Plate LXXVI *bis*, C.]

ASPLENIUM TRICHOMANES, *v.* RAMOSUM, *Wollaston, MS. Moore, Ferns of Gt. Brit. Nature Printed*, t. 39 F.; *Id., Handb. Brit. Ferns*, 3 ed. 183.

Caudex short, tufted, scaly, erect or decumbent. *Scales* lanceolate, brown, cellular, often with a dark central stripe. *Fibres* wiry, branching.

Vernation circinate.

Stipes short, smooth, chestnut-coloured or dark purple-brown, rounded behind, flat in front, with a raised line on the face at each angle; terminal and adherent to the rhizome. *Rachis*, also dark chestnut-brown throughout, keeled and rounded behind, flat in front, and there furnished with a narrow erect membranaceous concolorous wing-like border.

Fronds two or three inches to twelve or fourteen inches long, linear, pinnate. *Pinnæ* thick, herbaceous, deep green, numerous, variable in shape, but mostly roundish-oblong, obtuse at the apex, and obliquely cuneate at the base, scarcely stalked, but attached to

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the rachis by the lower angle, usually somewhat crenated but sometimes nearly entire on the margin, and always entire at the cuneate base. Sometimes most of the pinnæ, and usually the lower ones, are more ovate in outline and less unequal-sided; more rarely the reduction of the upper basal angle gives the pinnæ an obovate outline. The pinnæ are readily detached from the mature fronds, and eventually fall away, leaving the rachis bare.

Venation consisting of a midvein, from which issue forked *veins*, terminating within the margin; of the *venules* or branches the anterior one of each fascicle bears the sorus above the point of furcation.

Fructification generally distributed over the frond. *Sori* linear, oblique, numerous, often in age becoming confluent, indusiate. *Indusium* entire or slightly crenated on the free margin. *Spore-cases* numerous, globose. *Spores* angular, rough.

Duration. The caudex is perennial. The fronds are persistent, so that the plant is evergreen; the young fronds make their appearance in the spring months, about May.

This species has much general resemblance to *Asplenium viride*, but differs in various features. Thus, it may be known by its dark brown bluntly keeled rachides, with their thin raised anterior borders; and further by the attachment of the pinnæ, which are deciduous in this, but persistent in *viride*. It does not resemble any other native species. It is one of the most elegant of the smaller evergreen hardy kinds.

This species is generally distributed throughout the United Kingdom and Ireland, and is usually found growing on rocks, walls, and ruins; more rarely in hedgerow banks, where, however, it attains greater luxuriance. It is rare in the eastern counties of England, more abundant westward; and is found reaching an elevation of upwards of 2000 feet above the sea. Specimens from the west of Ireland, communicated by Mr. W. Andrews, and from Galway, by Mr. R. Barrington, are upwards of a foot in length, and furnished with about thirty pairs of pinnæ which are about half an inch long and a quarter inch broad; these large forms seem to have been in some instances incorrectly referred to the *Asplenium anceps*. The

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range of distribution for this plant, which is too common to render a complete record of localities necessary, is as follows :—

Peninsula.—Cornwall : Raven's Hugo, very fine, *Rev. C. A. Johns.* Devonshire: Ilfracombe; Marwood, *Rev. F. Mules;* Totnes, *C. Scott.* Somersetshire: Bath.

Channel.—Isle of Wight. Hampshire: Romsey. Wiltshire: Warminster (large form), *G. Wheeler.* Dorsetshire: Dorchester. Sussex: Findon.

Thames.—Hertfordshire. Kent: Maidstone. Isle of Sheppey. Surrey: Churt, near Godalming (large form), *E. Newman.* Buckinghamshire: Beaconsfield. Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire.

Severn.—Warwickshire. Gloucestershire. Monmouthshire. Herefordshire. Worcestershire. Staffordshire. Shropshire.

Trent.—Leicestershire. Nottinghamshire. Derbyshire. Rutland.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire: Settle, *A. Clapham.*

Tyne.—Durham: Teesdale. Northumberland.

Lakes.—Westmoreland. Cumberland: Keswick, *Miss Wright.* Isle of Man.

S. Wales.—Glamorganshire. Breconshire: Talgarth; Builth. Carmarthenshire: Dynevor Castle. Pembrokeshire.

N. Wales.—Anglesea. Denbighshire. Montgomeryshire. Merionethshire. Carnarvonshire.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire: St. Mary's Isle. Renfrewshire. Lanarkshire.

E. Lowlands.—Roxburghshire. Berwickshire. Edinburghshire. Linlithgowshire.

E. Highlands.—Stirlingshire. Clackmannanshire. Fifeshire. Perthshire: Pass of the Trosachs; Callander; Ben Lawers, *T. M.* Forfarshire: Fullarton (large form), *H. C. Watson.* Kincardineshire. Aberdeenshire. Morayshire. Nairnshire.

W. Highlands.—Argyleshire: Glen Gilp, *T. M.;* Glen Croe, *T. M.* Dumbartonshire. Isles of Arran: Brodick, *T. M.;* Bute: Rothesay, *T. M.;* Islay, and Cantyre.

N. Highlands.—Ross-shire. Cromarty. Sutherlandshire

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N. Isles.—Orkney.

W. Isles.—Tarbet, Harris.

Ulster.—Antrim. Down: Rostrevor.

Connaught.—Arran Isles. Galway: Connemara; Moycullen (large form), *R. Barrington.* Leitrim: Glencar, *R. B.*

Leinster.—Louth. Dublin. King's. Wicklow. Kilkenny.

Munster.—Cork. Kerry: Killarney (large), *W. Andrews.* Waterford. Tipperary. Limerick. Clare: Black Head, *R. Barrington.*

Channel Isles.—Jersey.

This Fern extends throughout Europe, from Scandinavia and Russia, through Germany, Hungary, Croatia, Dalmatia, Transylvania, and Turkey, eastwards to Greece and the Crimea, and through Belgium, France, and Switzerland to Italy, and thence westwards to the Spanish peninsula. In Africa it is found at Algiers; in the Cape de Verd Islands, in Madeira, and in the neighbouring Atlantic isles; and again at the Cape of Good Hope and in Kaffraria. In Asia it is found in the region of the Caucasus, in Tauria, in Persia, and in various parts of India, *e. g.*, Affghanistan, Kashmir, Bhotan, Simla; occurring also in Siberia—in the Ural and Altai ranges, and in the region of Lake Baikal; as well as in the Sandwich Isles. Some of the Simla and Persian specimens resemble *Asplenium anceps;* and the Altai yields a marked variety (ð. *altaica*), having the lower pinnæ nearly triangular, the upper narrow oblong, and the intermediate ones hastate; specimens of this form occur in the Hookerian Herbarium. The species is again met with in Australasia: in Tasmania, in New South Wales at Sydney, by the River Buchan, and on Mount Aberdeen in Victoria. In North America it occurs in various parts of the United States, from Vermont to New Mexico, and in British America, from Montreal to Nootka Sound; in South America in Columbia and Peru; and in the West Indies in Jamaica and Cuba. The *Asplenium anceps*, which occurs in the Canaries, Madeira, and the adjacent islands, is peculiar in its narrower and more elongated auriculate pinnæ, and its trigonous stipites, and this has not, we believe, been found in Britain.

The Common Maidenhair Spleenwort once had a medicinal reputation, which it appears to have now lost. According to Ray it was

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usefully employed in affections of the chest and lungs; and Lightfoot states that the country people in Scotland made from it a tea and a syrup, both of which were taken as remedies for coughs and complaints of the chest, though seldom used in the shops. This Fern is also sometimes referred to in old medical books as the source from which the syrup called Capillaire is prepared. Turner, in his *Herball*, published so long ago as 1568, calls it English Mayden's Heare, and says that "the juice stayeth the heare that falleth of, and if they be fallen off, it restoreth them agayne."

This plant grows with tolerable facility under artificial cultivation, but still is very apt to suffer if kept too damp under confinement, and cannot be said to submit freely to domestication. A compost of porous loamy soil containing a considerable proportion of sand and such hard but porous materials as broken sandstone, bricks, or old mortar, should be used, and excess of moisture must be avoided. In open rockeries in the pure air of country situations it succeeds well, when due precaution is taken against stagnant moisture, but in town gardens it requires a certain amount of shelter, and still more care is necessary to guard against the effects of too much moisture. In the greenhouse or frame, it seems impatient of confinement.

Mr. Wollaston, who is a very successful grower of Ferns, has remarked that this species succeeds best with him planted in sandy loam, with a *very slight* admixture of perfectly decayed leaf-mould, over plenty of drainage without moss above it, and with a free use of water, and thorough ventilation. "Finding it," he writes, "difficult to manage, I tested it in the following way:—I took six seedlings of *A. Trichomanes cristatum* of the same age, and as nearly as possible of the same size, and planted them in pots of the same size, but all in different admixtures of soil, giving them otherwise the same treatment. That planted in sandy loam did best, very perceptibly; that in sandy peat did worst; and that in pure leaf-mould was bad also."

Mr. C. Johnson* describes the species now under consideration as being easily cultivated, and admirably adapted for decorating shady

* Sowerby, *Ferns of Gt. Brit.*, 53.

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rockwork, the conditions of its natural growth being duly borne in mind. "Many persons think," he observes, "that if they put the root of the plant into soil, and water it, they have done all that is necessary; but the wall and the rock Ferns require something more than this. The thin succulent extremities of the wiry roots, insinuating themselves into every crevice, and absorbing on all sides the scanty moisture retained by the coarse material upon which they vegetate, are in removal generally left behind, and yet the plant is expected to live and flourish for the simple reason, that as it must have been half starved upon the dry wall and now has plenty to feed on, it ought to do so. The decayed mortar and the mouldering brick, while they afford the potash, lime, and other mineral substances necessary to fern structure, ensure the grand requisite of drainage, and admit no accumulation of moisture beyond that which is essential to vegetable life. Stagnant water, and especially when lodged in soil abounding in decomposing organic matter, is fatal to most of the species of this genus."

In endeavouring to account for the difficulties which occur in cultivating Ferns such as the present, which sometimes prove to be rather shy growers under artificial treatment, the natural conditions under which the plant occurs should be well studied. Here is a species naturally abundant and apparently free, which yet oftentimes refuses to maintain its natural vigour under cultivation. Why is this? In most cases it will be found that there is something wrong at the foundation: the roots of the plant are damaged or suffering. Indeed, this appears to be the principal source of failure in cultivating this species. In a natural state it grows on some perpendicular or sloping face of wall or rock, inserting its roots into the crevices and fissures, and there it finds enough nourishment. Even when it is growing on banks, the soil is generally of an open sandy texture, so that water cannot stagnate. It should, therefore, never be planted in large masses of soil retentive of moisture; and in planting, the crown should be elevated between fragments of stone, the pots should have an extra amount of drainage, and sand, or fine broken brick, or broken sandstone, or the rubbly portions of mortar from old buildings, should be freely used. In short, above that portion which is kept free for drainage, the pot should be filled up with coarse pieces

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of brick, rock, or mortar, and the interstices only filled with finer soil, consisting of the same ingredients, pounded or broken up, and mixed with a due proportion of sandy loam.

This peculiar mode of potting is suitable especially for the present species, the Wall Rue, and the Ceterach. None of these plants, moreover, require so much shade as other Ferns, although, if they are kept tolerably dry at the crown, they do not refuse to grow in structures which are shaded for other kinds. Water must be applied cautiously; the crowns or centres of growth should not be wetted, and the fronds themselves are the better for being kept dry, although an occasional syringing, if necessary to cleanse them, will not be found injurious, provided the fronds and the crown are afterwards allowed to get dry. The more successful instances we have seen of the cultivation of this Fern, were in cases in which the atmosphere of the greenhouse was kept rather drier than is usual in structures devoted to Fern culture.

Until lately very little variation had been observed in this species. Besides *incisum*, there had been found plants in which the apex of the frond was dichotomously divided, but as often occurs in other species, these have proved inconstant. There are now, however, several well-marked varieties known :—

1. *incisum* (M.). This is the most beautiful variety yet discovered, and is exactly analogous to the var. *cambricum* of *Polypodium vulgare*. The fronds are of the usual outline, pinnate. The pinnæ have a tendency to become triangular, and in some of the best forms of the variety are nearly uniformly so, with acute apices; they are deeply pinnatifid, the segments narrow oblong or elliptic, usually acute, and irregularly sometimes deeply serrated, the larger ones not unfrequently lobate. It has been found in several localities, namely—Devonshire, *Rev. W. S. Hore*. Lancashire: Kant Clough, near Burnley, *S. Gibson*. Yorkshire: Smeerset, near Settle, *J. Tatham*, *A. Clapham*. Cumberland: Borrowdale, *Miss Wright*. ? Clare, *J. R. Kinahan*. Jersey, *Sherard*, according to Plukenet. The Settle form, as communicated to us from Mr. Clapham's garden, is the finest we have seen. In this the more perfect pinnæ sometimes

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measure three-fourths of an inch in length, and about the same across the base, the basal lobes right and left being cut down nearly to the costa, and themselves lobate with serrated segments, and the upper lobes being cut in proportion. It is an exceedingly rare plant, difficult to cultivate, and uniformly barren. [Plate LXXVI *bis*, A.]

2. *lobatum* (M.). This is a large form, resembling *crenato-lobatum*, but remarkable for having the pinnæ, especially those about the middle of the frond, furnished at the base with about two deeply divided broad obovate lobes, the lowest of which are in some instances separated from the rest of the pinnæ almost to the midrib. It was found in Devonshire by the Rev. J. M. Chanter; and in a smaller form at Ottery St. Mary by Mr. Wollaston. This appears to be the same as the var. *sectum* of Milde, found in Silesia.

3. *crenato-lobatum* (M.). This resembles a vigorous normal form, except that the pinnæ, which are large, oblong, obtuse, are deeply but finely crenate-lobate, so as to acquire a toothed margin which is tolerably uniform throughout. It was sent from Nettlecombe, Somersetshire, by Mr. C. Elworthy; and a similar plant has been sent from Mill Slade, near Linton, Devonshire, by Mr. C. Jackson.

4. *subæquale* (M.). This form is a very elegant one, approaching the more perfect condition in which the var. *depauperatum* is occasionally found. The fronds are sometimes narrowish and elongated, with the pinnæ distinct; sometimes broad and shorter with the pinnæ large and crowded: but the most remarkable peculiarity is, that the pinnæ, instead of being obliquely cuneate at the base, as in the usual forms, (in which the costa apparently proceeds from the lower basal angle, and the attachment is consequently nearly in a line with the lower margin) are nearly or quite equal-sided at the base, the costa and consequently the attachment being nearly or quite central. The upper pinnæ are oblong, the lower ones often obtusely deltoid, the margins being either repand, that is, slightly sinuated so as to form a gently waving line, or more or less deeply crenate-dentate, often very elegantly crenated. It was first sent to us from the banks of the Wye, near Monmouth, by Mr. J. D. Enys. We have also received it from—Yorkshire: Knaresborough, *A. Clapham*. Westmoreland: Whitbarrow, *F. Clowes*. Somersetshire: Nettlecombe,

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C. Elworthy. Kent: Tunbridge Wells, *Mrs. Delves.* It is apparently near the var. *umbrosum*, Milde. [Plate LXXVI B.]

5. *depauperatum* (Woll.). This curious form is remarkable for its interrupted or depauperated character. The pinnæ in the most marked examples are very narrow, serrate or laciniate, and towards the apex of the frond they become depauperated so that the spore-cases protrude and appear to come from the margin or upper surface of the frond, giving the plant a very curious appearance; sometimes a portion of the pinnæ are wanting, and in other cases the apex is reduced to a mere winged rib. This very marked form, which was found in 1853, by Dr. Allchin, at Black Head, Clare, Ireland, and in 1855, by Mr. Wollaston, at Rydal, in Westmoreland, is very rare. Other forms evidently closely allied to this, though less or sometimes scarcely at all depauperated, and then having the pinnæ distinctly crenated, were found at the same place by Dr. Allchin. Between these two extremes, various plants referrible to this variety have been met with, *e. g.*—Yorkshire: Firby, *C. Monkman.* Westmoreland: Whitbarrow, *F. Clowes.* The more perfect examples merge into *subæquale.* [Plate LXXVI C.]

6. *ramo-depauperatum* (Claph.). This resembles *depauperatum* in its general character, so far as respects the irregular diminution, or here and there the absence of the pinnæ. It differs in having the rachis divided, sometimes near the base, sometimes higher up, into several branches, the branches again dividing, so that the frond consists of an irregular tuft of branchlets, varying, in the fronds before us, from six to twelve in number. The apices of these branchlets become developed into dilated obtuse lobes, scarcely crispy, but giving a cristate appearance to the fronds. This variable form, which is sometimes nearly normal below, and usually most depauperated on the branchlets, appears to be of garden origin. It was sent to us by Mr. A. Clapham, of Scarborough.

7. *bifurcum* (Woll.). This is a neat and pretty variety, differing from the normal plant in having the apical lobe enlarged or dilated, and two or three times forked. This, which is rare, and constant under culture, was found near Maidstone, in Kent, by Mr. Wollaston. A similar plant has been gathered on the wall of Hoddam Kirkyard, in Dumfries-shire, by Mr. W. G. Johnstone. [Plate LXXVI A.]

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8. *ramosum* (Woll.). This is a much ramified form, so nearly constant under cultivation as to claim a place among the permanent varieties. The rachis is two or three times forked, and the apical lobes, as in *bifurcum*, are frequently enlarged and bifid or multifid. When there are many divisions of the rachis, the pinnæ sometimes become irregular and depauperated, and they are often strongly crenate. It has been found in Devonshire, at Newte's Hill, near Tiverton, and in some abundance near Ilfracombe, by Mrs. Chanter; also by Dr. Kinahan on Quin Abbey, Clare, Ireland; and by Mr. F. Clowes, near Windermere, Westmoreland. A very beautiful form, analogous to these, but branching lower down the rachis, has been sent from the neighbourhood of Keswick by Miss Wright; this forms our illustration. [Plate LXXVI *bis*, C.]

9. *multifidum* (M.). This is ramosely forked in the rachis some distance below the apex of the frond, usually twice, sometimes three times, and the apices of the branches are all dilated and multifid-crisped, forming spreading tufts, but the branching is irregular. In a fine example now before us, cultivated by Mr. Clapham, there are about a dozen of these dilated apical tufts of confluent segments. It is a free-growing handsome variety, and proves constant, having been abundantly reproduced from the spores. This was found by Mr. Dick at St. Mary's Isle, Kirkcudbright, and has been communicated and distributed by Mr. J. McNab, from the Edinburgh Botanic Garden. [Plate LXXVI *bis*, B.]

10. *cristatum* (Woll.). This very graceful and uncommon form has the apex of the frond spread out into a beautiful symmetrical tuft or tassel, but it seldom if ever ramifies except at the apex of the rachis. It has a free and vigorous habit of growth, and is invariably reproduced from the spores, and constant under cultivation. The early history of this variety is lost, but some seedling plants made their appearance in a mass of *Hymenophyllum unilaterale* sent to the late Mrs. Delves of Tunbridge Wells, Kent, from the Glasgow Botanic Garden. [Plate LXXVI *bis*, D.]

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THE GREEN SPLEENWORT.

ASPLENIUM VIRIDE.

A. fronds linear, pinnate; pinnæ subrotund, roundish-ovate, or rhomboidal, crenated, distinctly stalked; rachis green, compressed, slightly channelled in front, not winged; sori approximate to the midrib. [Plate LXXVII.]

ASPLENIUM VIRIDE, *Hudson, Fl. Ang.* 1 ed. 385; 2 ed. 453. *Bolton, Fil. Brit.* 24, t. 14; *Id.*, t. 2, fig. 3. *Smith, Eng. Bot.* xxxii. t. 2257; *Id., Eng. Fl.* 2 ed. iv. 293. *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Babington, Man. Brit. Bot.* 4 ed. 426. *Mackay, Fl. Hib.* 341. *Deakin, Florigr. Brit.* iv. 71, fig. 1593. *Newman, Hist. Brit. Ferns,* 3 ed. 243. *Moore, Handb. Brit. Ferns,* 3 ed. 186; *Id., Ferns of Gt. Brit. Nature Printed,* t. 40; *Id. Ind. Fil.* 177. *Sowerby, Ferns of Gt. Brit.* 54, t. 31. *Bentham, Handb. Brit. Fl.* 633, under *A. Trichomanes. Lowe, Nat. Hist. Ferns,* v. t. 28. *Schkuhr, Krypt. Gew.* 68, t. 73. *Fl. Dan.* t. 1289. *Svensk Bot.* tt. 462, 774. *Willdenow, Sp. Plant.* v. 332. *Poiret, Enc. Supp.* ii. 511. *Sprengel, Syst. Veg.* iv. 86. *Presl, Tent. Pterid.* 108. *Link, Fil. Sp.* 90. *Fée, Gen. Fil.* 190. *Koch, Syn.* 2 ed. 982. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 521. *Sturm, Fl.* (Farrn.).t. 10. *Mettenius, Fil. Hort. Bot. Lips.* 72; *Id. Asplen.* 139. *Heufler. Aspl. Europ.* 21. *Nyman, Syllog. Fl. Europ.* 432.

ASPLENIUM INTERMEDIUM, *Presl, Del. Prag.* 232; *Id., Tent. Pterid.* 108, t. 3. fig. 22.

ASPLENIUM UMBROSUM, *Villars, Hist. Pl. Dauph.* 281.

ASPLENIUM TRICHOMANES RAMOSUM, *Linnæus, Sp. Plant.* 1541.

ASPLENIUM TRICHOMANES ELEGANS, *Solander MS. Hb. Mus. Brit.*

Caudex tufted, decumbent or somewhat creeping, sparingly scaly at the crown. *Scales* lanceolate, dark brown, cellulose. *Fibres* slender, branched.

Vernation circinate.

Stipes variable, sometimes quite short, usually about a third of the length of the frond, smooth, dark brown at the base, green upwards, semiterete; terminal and adherent to the caudex. *Rachis* green, slender, compressed, slightly grooved in front.

Fronds two or three inches to eight or ten inches long, linear, delicately herbaceous, palish green, pinnate. *Pinnæ* variable in form, usually roundish-ovate, and broadly cuneate at the base, or

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sometimes more obliquely cuneate there, thus becoming subtrapeziform or rhomboidal, distant and usually opposite below, more crowded and alternate above, attached by a distinct slender stalk, the margin crenated or inciso-crenate, except at the cuneate base, which is entire. Occasionally the pinnæ are equal-sided and broadest at the base, much shortened and rounded at the apex; and sometimes they are more elongated and acute.

Venation consisting of a *costa* or midvein, producing forked *veins* at the base of the pinnæ, and simple ones above. The veins and venules terminate abruptly within the margin, the point of termination being marked by an elevation on the upper surface.

Fructification more copious on the upper part of the frond, produced on the anterior side of the vein; opposite the furcation and extending below it, if the vein is forked, and situated toward the base, that is, near to the costa, if the veins are simple. *Sori* linear oblique, indusiate, contiguous to the costa, and soon becoming confluent. *Indusium* narrow, crenated on the free margin. *Sporecases* globose. *Spores* angular, rough.

Duration. The caudex is perennial. The fronds are produced in spring, and remain fresh through the winter, so that the plant is evergreen.

Though similar to *A. Trichomanes*, and associated with it by some of our first botanists, this plant may be distinguished by its green compressed rachis, which is not prominent and rounded behind, nor furnished with a membranaceous border on the anterior face; also by the more central situation of the sori, which are placed rather below than above the fork of the veins. It is, moreover, always of a much paler green colour, and has a more delicate herbaceous appearance.

The Green Spleenwort is found principally in the moist mountainous rocky districts of the north of England and Scotland, widely dispersed, and of frequent occurrence in congenial situations, but not generally abundant. It is also not unfrequent in Wales, and is found in Shetland. More southern stations are reported in the provinces of the Severn, Trent, and Mersey; but in these it is very local. It has also been found located in somewhat dubious situations

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in the counties of Sussex, Middlesex, Kent, and Surrey, in these cases having probably escaped from cultivation. In Ireland it appears to be a rare plant, though occurring in the counties of Donegal, Sligo, Cork, and Kerry. Mr. Watson records its greatest altitude above the sea as being about 2850 feet. The recorded habitats are:—

Channel.—Sussex: in the parapet wall of an old cellar window at Danny, ten miles from Brighton, *Rev. T. Rooper.*

Thames.—Middlesex: wall near Arno's Grove, Southgate, *V. E. Walker.* Kent: wall at Maidstone, *Plukenet.* Surrey: old wall at Mickleham, *W. Borrer.*

Severn.—Worcestershire: Ham Bridge, *T. Westcombe.* Staffordshire: Dovedale.

Trent.—Derbyshire: Buxton, *Dr. Wood;* Cavedale, Castleton, *Rev. G. Pinder;* Dovedale. Leicestershire: Beacon Hill, Charley forest, *Pulteney.*

Mersey.—Cheshire: Carr-edge, *Mr. Bradbury.* Lancashire: Dulesgate; Staley.

Humber.—Yorkshire: Settle, *T. Wilcke;* Craven (ramose form), *Rev. J. S. Henslow;* Ingleborough, *Bolton;* Gordale, *R. Bowman;* near Ais-la-Beck, and Richmond, *J. Ward;* Widdal Fell, Wensleydale; Ogden Clough, near Halifax, *Bolton;* Reeth Moor, Swaledale; Black Bank, near Leeds; and many other parts.

Tyne.—Durham: Falcon Clints, Teesdale, *T. Simpson;* Weardale, *Sir W. C. Trevelyan, Bart.* Northumberland: Banks of the Irthing, *Rev. R. Taylor.*

Lakes.—Westmoreland: rocks above Patterdale; Kendal Fell, *W. Christy;* Hutton Roof; Farlton; Arnside, *Rev. G. Pinder;* Casterton Fell; Mazebeck Scar, *R. B. Bowman;* Ambleside. Cumberland: Ashness Gill; Borrow Force; Gillsland, *Winch;* Brandy Gill, Carrick Fell; Borrowdale, *Miss Wright.*

S. Wales.—Brecknockshire: Brecon Beacon and Trecastle Beacon, near Brecon; Chapel-y-Fin, *T. Westcombe;* Scwyd-yr-Henryd, near Capel Colbren, *E. Lees.* Glamorganshire: Merthyr-Tydvil, *C. C. Babington;* Cilhepste Waterfall, near Pont Nedd Vechn, *Dillwyn;* Darran-yr-Ogof, near Ystradgunlais, *Dillwyn.*

N. Wales.—Merionethshire: Cader Idris, *J. E. Bowman.* Car-

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narvonshire: Cwm-Idwal; Twll-du, *T. H. Cooper;* Llyn-y-cwm, *E. Newman;* Glyder-Vawr; Clogwyn-du-Yrarddu; Clogwyn-y-Garnedd, *Rev. T. Butler;* Llanberris, *Dr. Allchin* (ramose form).

W. Lowlands.—Dumfries-shire: Bold Craig, near Moffat, *Rev. W. A. Little;* Grey Mare's Tail, *W. Stevens.* Lanarkshire: Falls of the Clyde, *W. Gourlie.*

E. Highlands.—Stirlingshire. Perthshire: Blair Athol; Ben Lawers; Ben Chonzie, near Crieff; Ben Voirlich, *W. Gourlie.* Forfarshire: Canlochen, Clova, *A. Croall.* Nairnshire: Cawdor Woods, *W. Staples.* Aberdeenshire.

W. Highlands.—Inverness-shire. Argyleshire: Dunoon, and other parts. Arran: Glen Cloy, *Dr. Balfour.* Isle of Mull: Ben More.

N. Highlands.—Sutherlandshire: Assynt. Ross-shire, *Rev. G. Gordon.*

N. Isles.—Shetland.

Ulster.—Donegal: near Lough Eske, *E. Murphy.*

Connaught.—Sligo: Ben Bulben, *N. B. Ward.*

Munster.—Cork: Bandon, *Dr. Taylor.* Kerry: Turk Mountain, Killarney, *Dr. Mackay.*

This elegant little species is a native of the whole of northern and central Europe, chiefly in alpine and subalpine situations, though Mr. Newman mentions (*Hist.* 244) its occurrence at Grasse, in the south of France, where the climate is mild, and the altitude but little above the sea-level. It extends from Lapland, Finland, Norway, and Sweden, to Great Britain, France, Switzerland, Belgium, Germany, Bohemia, Dalmatia, Croatia, Italy, Spain, and Greece, occurring also in Tauria. In Asia, it is found in India: Kumaon, and in Eastern Siberia; and it is further met with in the Island of Sitka, whence it extends to the Rocky Mountains of North-West America. A South American plant, found in the mountains of Peru and Colombia, the *A. fragile* of Presl, is closely allied to our British species, but is proliferous on the stipites. "Were it not for the curious little viviparous bulbilli seen upon the stipes," observes Sir W. J. Hooker,* "it would be difficult to say in

* Hooker, *Icones Plantarum.* t. 932.

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what respect this species differs from *A viride* of the European Alps; and it is possible that this peculiarity may originate in its elevated locality, which is no doubt very considerable at all times on the Andes of Colombia."

At home on the mountain sides this delicate species does not bear so well as many others the atmosphere of lowland situations, especially if to this be added the impurities which occur in towns or cities: hence, except in favourable localities not affected by smoke, the plant will not bear exposure. It is generally found necessary to cultivate it under glass, a cold frame, occasionally ventilated and with the atmosphere kept moderately moist, being most suitable for it. The soil should be of a rocky nature, and no stagnant water should be suffered to remain about it. It however seldom attains under cultivation, the size which it acquires in sheltered situations amongst its native rocks, in the interstices of which its roots delight to insinuate themselves, and that often so firmly as to render it next to impossible to extract the plants uninjured.

For pot culture in a moist shady greenhouse or frame, a soil composed of equal parts of loam, peat, silver sand, and sandstone rock broken up into lumps of one or two inches diameter, should be employed, and the pots must be well drained, because, as it is necessary that the roots should be kept moist, provision must be made for the free passage of the water applied that it may not stagnate. The proportion of rocky material, for which soft broken brick is a passable substitute, may be even increased with advantage, the object being to provide for the moisture being drawn away from the crowns, whilst it laves the absorbing fibres of the roots.

In out-door rockeries such species as the present would be benefited by the use of a kind of bell glass provided with a vent at the top, which may either be opened or closed at pleasure. The use of such a glass would be to retain something like a moist atmosphere about the plants during the arid summer months, and to shield the crowns from excess of wet in winter. If the aperture, or apertures, were but of moderate size both these objects would be secured without ever closing the glass, and thus risking another evil, from which mountain plants when brought under artificial culture, away

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from their pure and airy habitats, are liable to suffer—that of suffocation from too close confinement.

The species, like others of similar habit, may be increased by division of the crowns.

The varieties of this kind of Spleenwort are not numerous; the following only, which are not very strongly marked, are known to us:—

1. *multifidum* (Woll.). This is bifidly or multifidly divided towards the apex of the frond, and is rather more lax than the normal state of the species. It is almost as frequent in some localities as the normal form, and sub-permanent under cultivation. We have it in a characteristic state from—Yorkshire: Settle, *A. Clapham.* Westmoreland: Whitbarrow, *R. Morris.* Carnarvonshire: Llanberris, *Dr. Allchin.*

2. *bipinnatum* (Clowes). The pinnæ of this variety are deeply incised, very much as in *Asplenium Trichomanes incisum.* It was found on Whitbarrow, in Westmoreland, by Mr. I. Hudhart, in 1853, and was in the possession of Mr. Clowes, of Windermere.

3. *incisum* (M.). This form seems to be generally of free growth, the specimens being from six to nine inches high. The pinnæ are oblong or trapeziform, and the margin is deeply cut into bluntish teeth, instead of being crenated, as in the more characteristic form of the species. It is probably a not uncommon form, as we have seen it from various localities:—Carnarvonshire, *J. Atkins;* Crosby Ravensworth, *R. Clarke;* Whitbarrow, *R. Morris;* Drummond Hill, Perthshire, *C. M'Intosh.*

4. *acutifolium* (Gibs.). The pinnæ of this form, which was found by the late Mr. S. Gibson, are lanceolate and acute, according to Mr. Newman, whose brief account is all we know of it.

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THE RUE-LEAVED SPLEENWORT, or WALL RUE.

ASPLENIUM RUTA-MURARIA.

A. fronds deltoid, bi-tri-pinnate; pinnules obovate, or rhomboidal, wedge-shaped and entire at the base, acute rounded or truncate and toothed at the apex; sori linear, crowded, central: indusium crenulate. [Plate LXXVIII.]

ASPLENIUM RUTA-MURARIA, *Linnæus, Sp. Plant.* 1541. *Bolton, Fil. Brit.* 28, t. 16. *Smith, Eng. Bot.* iii. t. 150; *Id., Eng. Fl.* 2 ed. iv. 296. *Hooker, Gen. Fil.* t. 30. *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Babington, Man. Brit. Bot.* 4 ed. 426. *Deakin, Florigr. Brit.* iv. 75, fig. 1596. *Bentham, Handb. Brit. Fl.* 633. *Lowe, Nat. Hist. Ferns,* v. t. 27. *Newman, Hist. Brit. Ferns,* 2 ed. 261. *Moore, Handb. Brit. Ferns,* 3 ed. 188; *Id., Ferns of Gt. Brit. Nature Printed,* t. 41 A; *Id., Ind. Fil.* 163. *Sowerby, Ferns of Gt. Brit.* 55, t. 32. *Willdenow, Sp. Plant.* v. 341. *Schkuhr, Krypt. Gew.* 75, t. 80 *b*. *Sprengel, Syst. Veg.* iv. 88 (excl. syn. Kitaibel). *Presl, Tent. Pterid.* 108. *Link, Fil. Sp.* 97. *Fée, Gen. Fil.* 190. *Gray, Bot. North. United States,* 627. *Koch, Syn.* 2 ed. 983. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 520. *Fl. Dan.* t. 190. *Svensk Bot.* t. 306. *Mettenius, Fil. Hort. Bot. Lips.* 77; *Id., Aspl.* 143. *Heufler, Aspl. Europ.* 95. *Nyman, Syll. Fl. Eur.* 432.

ASPLENIUM MATTHIOLI, *Gasparrini, Notul. piante Lucan.* 2; *Id., Guss. Fl. Sic. Syn.* 663.

ASPLENIUM MURALE, *Bernhardi, Schrad. Journ. Bot.* 1799, i. 312; 1801, i. 19. *Salisbury, Prod.* 403. *Gray, Nat. Arr. Brit. Pl.* ii. 14. *Stokes, Bot. Mat. Med.* iv. 610.

ASPLENIUM MURORUM, *Lamarck, Fl. Franç.* i. 28.

ASPLENIUM PYGMÆUM, *Linnæus fil.*

ADIANTUM PYGMÆUM, *Linnæus MS. in Herb.*

ACROSTICHUM RUTA-MURARIA, *Lamarck, Illustr.* t. 865, fig. 1.

AMESIUM RUTA-MURARIA, *Newman, Hist. Brit. Ferns,* 2 ed. 10; 3 ed. 254; *Id., Phytol.* 1851, *App.* viii.

PHYLLITIS RUTA-MURARIA, *Mœnch, Method.* 724.

SCOLOPENDRIUM RUTA-MURARIA, *Roth, Fl. Germ.* iii. 52.

TARACHIA RUTA-MURARIA, *Presl, Epim. Bot.* 81.

Caudex short, tufted, scaly. *Scales* small, very dark brown, narrow lanceolate, striato-reticulate. *Fibres* numerous, dark-coloured, wiry, branched.

Vernation circinate.

Stipes as long as, or longer than the frond, smooth, dark purple at

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the base, green in the upper part; terminal, and adherent to the caudex. *Rachis* smooth, green.

Fronds one to six inches long, numerous, deep green, more or less coriaceous, deltoid, bi-tri-pinnate; in the young or juvenile state simple and reniform, or trifoliately pinnate with roundish or sub-reniform leaflets, these trifoliate fronds often fertile. *Pinnæ* alternate. *Pinnules* obovate or rhomboidal, the base wedge-shaped entire and tapering into a more or less distinct petiole, the apex rounded or truncate or sometimes acutely prolonged always toothed, the teeth small and nearly equal.

Venation consisting of a series of *veins* repeatedly forked from the base, so that there is no distinct *costa* or midvein; the number of the branches or *venules* which are developed correspond with the number of marginal teeth.

Fructification on the back of the frond, borne on the inner sides of the venules about the centre of the pinnæ. *Sori* linear, few, sometimes simulating those of *Scolopendrium*: being contiguous nearly opposite and opening inwardly from each margin; often becoming confluent, especially when the plants are starved, in which condition they produce small pinnules and abundant sori confluent over the whole under surface. *Indusium*, a thin narrow membrane, having the free margin wavy or crenulate. *Spore-cases* dark brown, numerous, roundish, obovate, coarsely reticulate. *Spores* roundish, strongly muriculate.

Duration. The caudex is perennial. The fronds are produced in spring, and retained through the winter, until after fresh ones appear, so that the plant is evergreen.

In its usual condition this species is easily recognised; the characters afforded by the deltoid outline, bipinnate or tripinnate division, and distinct cuneate pinnules, taken together with the small size of the fronds, sufficiently distinguishing it from the other *Asplenium*s. There are, however, certain forms of the species which are not at first sight easily separated from *A. germanicum*, being narrow in the fronds or pinnules, and sometimes scarcely more than pinnate. These states are best distinguished by the crenulate indusium, and by the fine even toothing of the anterior margin; the

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indusium in *Asplenium germanicum* being entire, and the apex of its pinnules having fewer deeper and more unequal incisions.

The Wall Rue is generally distributed through Great Britain and Ireland, occurring, however, less frequently on the eastern side of England, as mentioned by Mr. Newman, and becoming rare in the Highlands, according to Mr. Watson. It grows on rocks and on ruins, and in abundance on old walls. Its range of altitude is estimated to extend from the coast level to an elevation of 600 feet or upwards. It is too common a plant to admit of more than the following indications of its distribution being here given:—

Peninsula.—Cornwall. Devonshire: Marwood, *Rev. F. Mules;* Totnes, *C. Scott.* Somersetshire: Bath, *Rev. E. Bosanquet.*

Channel.—Dorsetshire: Poxwell Church, Dorchester. Wiltshire. Isle of Wight. Hampshire. Sussex: Arundel Castle, *G. McEwen.*

Thames.—Hertfordshire. Middlesex: Fulham Church, *D. Maher.* Kent: Penshurst; Dartford Church, *Gerarde;* Sittingbourne, *Gerarde.* Surrey: Albury (broad form), *T. M.* Berkshire: Windsor Home Park, *T. Cox.* Buckinghamshire. Oxfordshire. Essex: Rayleigh Church, *Gerarde.*

Ouse. — Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Northamptonshire.

Severn.—Warwickshire. Gloucestershire. Monmouthshire. Herefordshire. Shropshire. Worcestershire. Staffordshire.

Trent.—Leicestershire. Nottinghamshire. Derbyshire. Rutland.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire: Hackness, *A. Clapham.*

Tyne.—Durham. Northumberland.

Lakes.—Cumberland: Keswick (various forms), *Miss Wright.* Westmoreland.

S. Wales.—Glamorganshire. Brecknockshire. Carmarthenshire: Dynevor Castle. Pembrokeshire: inside the church at Manorbeer, *Mrs. E. T. Drake;* Manorbeer Castle, *Miss Hutton.*

N. Wales.—Anglesea: Priestholme Island, *Rev. W. A. Leighton.* Denbighshire, *Dr. Roulston.* Merionethshire. Carnarvonshire: old wall near Capel Curig, *A. L. Taylor.*

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W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrew-shire. Lanarkshire.

E. Lowlands.—Berwickshire. Edinburghshire: Salisbury Crags. Linlithgowshire.

E. Highlands.—Stirlingshire: Stirling, *Dr. Lawson.* Clackmannanshire. Fifeshire, *C. Howie.* Perthshire: Dunkeld (various forms), *A. Tait.* Forfarshire. Kincardineshire. Aberdeenshire. Banffshire. Morayshire. Nairnshire.

W. Highlands.—Argyleshire. Dumbartonshire. Ailsa Craig. Isles of Iona, Islay, and Cantyre.

N. Highlands.—Cromarty. Sutherlandshire. Caithness. Ross-shire: Loch Alsh, *Miss Mahy.*

N. Isles.—Orkney.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Down, *A. Crawford.* Donegal, *R. Barrington.*

Connaught.—Arran Isles. Galway: Connemara. Leitrim: Glen Car, *R. Barrington.*

Leinster.—Louth: chimney of old castle of Castletown, Dundalk, *Miss Johnston.* Dublin. King's County. Wicklow. Kilkenny.

Munster.—Cork. Waterford. Tipperary. Limerick. Kerry: Mucruss (several forms), *Dr. Allchin;* Killarney, *R. Barrington.* Clare, on limestone boulders, *Dr. Allchin.*

Channel Isles.—Jersey.

This Fern is spread over the whole of Europe, from Finmark in Norway, through Scandinavia, Russia, Great Britain, France, Belgium, Holland, Switzerland, Germany, Hungary, Transylvania, Croatia, Dalmatia, Spain, Portugal, Italy, Sicily, Corsica, Greece, Turkey, and the Crimea. It is found in North Africa, at Algiers, and also in South Africa. In Asia, it is met with in Kashmir, and Thibet, in the Caucasian provinces of Asiatic Russia, as well as on the Asiatic side of the Ural Mountains, and in the regions of the Altai, and of Lake Baikal in Siberia. It is also found in North America, extending from Vermont to North Carolina, Michigan, etc.

As to its properties, Lightfoot says, "It was formerly received in shops as a pectoral and deobstruent, and recommended in coughs

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asthmas, obstructions of the liver and spleen, and in scorbutic complaints, but is at present out of repute."

Some cultivators are tolerably successful with this plant, but it is not generally found easy of culture. Those appear to succeed the best, who keep their Ferns drier than usual. The Wall Rue requires a very porous soil of sandy loam, with a large proportion of old mortar and fragments of soft brick, and to have the watering-pot applied very cautiously to the soil, and perhaps never to the leaves. The plants, too, ought to have an open or elevated site, especially if in a house or frame, so that a continual evaporation may relieve them of the moisture which has been applied to them. The plants are increased by division. It has been suggested by Mr. G. W. Johnson, that the best mode of raising this Fern, which is difficult to transplant, on account of its roots becoming so firmly fixed in the rocks or walls on which it grows, would be to collect the spores, and to sow them in a pot of carefully prepared soil. Old lime rubbish and sandy loam are the best ingredients for this purpose. The pot should be kept moist in a cold frame or greenhouse, without watering over its surface, until the spores have vegetated: this may be secured by covering the pot with a glass, and setting it in a feeder filled with water.

There are comparatively few variations of this species yet noticed. Like many other ferns, it occasionally produces a few dichotomous fronds, but such plants do not become entirely or constantly dichotomous. The other forms are enumerated below:—

1. *pinnatum* (M.). This form is only once pinnate, and is furnished with several rhomboidal pinnæ, which are stalked, and crenato-dentate in the upper or larger half. It was found at Mucruss, Killarney, by Dr. Allchin.

2. *trifidum* (M.). A small pinnate form, the lower pinnæ on longish footstalks, small, dividing nearly to the base into three small wedge-shaped segments, which are blunt and scarcely toothed at the apex. It has been sent from Castle Malgwyn, Pembrokeshire, by Mr. W. Hutchison.

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3. *cuneatum* (M.). This form is often scarcely more than pinnate, with long narrow pinnæ which are cuneate below, and truncate or more or less abrupt and sublobate above, with numerous fine sometimes longish teeth. When very vigorously grown, the basal pinnæ divide into three pinnules, of which the lowest is often distinct, the others more or less combined, but they retain their peculiar elongate cuneate form. This variety in its less divided state has sometimes been mistaken for *Asplenium germanicum*, but the texture is stouter than in that plant, the parts are broader, and the apical teeth are smaller or narrower and comparatively equal. The plant has been obtained from Stenton Rock, near Dunkeld, Perthshire, by several botanists. [Plate LXXIX A.]

4. *spathulatum* (M.). This is a large and vigorous form, remarkable for having the base of its pinnules narrowed downwards, so that, the apex being bluntish, they become spathulate. The apex is sometimes rounded off, but it is more usually bluntly angular, the pinnule thus acquiring something of an elongated rhomboidal outline. It is probably a not uncommon form: we have seen it from—Kent: Town Malling, *Dr. Allchin*. Devonshire: Marwood, *Rev. F. Mules*. Yorkshire: Settle, *A. Clapham*. Perthshire: Dunkeld, *Rev. R. Taylor*. Fife, *C. Howie*.

5. *elatum* (Lang). This is a tall but slender form, bipinnate or sometimes almost tripinnate, but chiefly remarkable for the small size, and narrowly wedge-shaped form of the pinnules, which are usually bluntish and toothed at the apex, but sometimes truncate, and occasionally subtrilobate. We have seen this form from—Ireland: Ennis, *Dr. Allchin;* Mitchelstown Castle, near Cork, *P. F. Keir;* near Athenry, Galway, *R. Barrington;* Keswick, Cumberland, *Miss Wright*. The same appears to have been found by Mr. Wilson in Dovedale. [Plate LXXIX D.]

6. *dissectum* (Woll.). This very elegant form has the pinnules elongated and deeply incised. It is an unusual state of the species, and has been found by Mr. Wollaston in Devonshire, and by Dr. Kinahan in the county of Louth, Ireland.

7. *unilaterale* (M.). This curious variety is remarkable for its one-sided growth, developing a normal pinna on one side of the frond, while the rest is confused, with the rachis often excurrent and

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hooked at the point; sometimes the pinna becomes an enlarged branch. The whole growth is irregular and monstrous. It was found at Mucruss, Killarney, by Dr. Allchin; and a somewhat similar form has been gathered at Black Head, Clare, by Mr. Barrington. [Plate LXXIX C.]

8. *variabile* (M.). This sub-tripinnate variety is remarkable for the variety of form presented in the fronds. The more normal-looking fronds have the pinnules obovate-wedge-shaped, distant, spreading, and inciso-dentate at the apex; but some fronds are considerably depauperated, both pinnæ and pinnules irregular in development, the latter much reduced in size, and having two or three horn-like lobes instead of teeth; one side of the frond on the upper portion is frequently still less produced. Between the normal and the depauperated fronds, there are many intermediate states. It has been sent from Settle, Yorkshire, by Mr. A. Clapham.

9. *sectum* (M.). A small form with the pinnules incised at the ends, two or three of the segments being usually longer than the others, and producing a forked or trifid or laciniated appearance. It was found at Arnside by Mr. J. Crossfield.

10. *cristatum* (Woll.). This is an interesting permanent variety, nearly all the fronds being affected. The best form is bipinnate, with narrowish pinnules, those which terminate the frond and the pinnæ being dilated at the apex, and somewhat crispy. This form has been found near Ruthin Castle, Denbighshire, by Mr. J. Daniels. In other forms the fronds are more variable: some are crowded or tasselled at their apices, others have their apical lobes, as it were, folded on each other, and not unfrequently the rachis is divided; while the pinnules vary somewhat in nearly every plant. It has also been found in—Surrey: near Guildford, *Dr. Allchin*. Kent: near Tunbridge Wells, *G. B. Wollaston*. A proliferous form (*proliferum*, Woll.) has young plants seated in the axils of the pinnules; it was found by Dr. Allchin, sparingly mingled with the former. [Plate LXXIX B.]

11. *ramosum*. (M.) A curious form, branched in the stipites and in the rachides below the pinnules, which latter are angular in form and sometimes partially depauperated. It was found at Arnside by Mr. J. Crossfield.

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THE ALTERNATE-LEAVED SPLEENWORT.

ASPLENIUM GERMANICUM.

A. fronds linear oblong, broadest at the base, pinnate or sub-bipinnate; pinnæ alternate, ascending, narrow wedge-shaped, toothed at the apex, entire below, the lower ones three-cleft; sori elongate central; indusium entire. [Plate LXXX A.]

ASPLENIUM GERMANICUM, *Weis, Pl. Crypt.* 299. *Gray, Nat. Arr. Brit. Pl.* ii. 13. *Newman, Hist. Brit. Ferns*, 2 ed. 265. *Deakin, Florigr. Brit.* iv. 77, fig. 1597. *Babington, Man. Brit. Bot.* 4 ed. 426. *Bentham, Handb. Brit. Fl.* 633. *Lowe, Nat. Hist. Ferns*, v. t. 3 B. *Moore, Handb. Brit. Ferns*, 3 ed. 191; *Id., Ferns of Gt. Brit.* t. 41 B; *Id., Ind. Fil.* 134. *Lamarck, Enc. Bot.* ii. 309. *Willdenow, Sp. Plant.* v. 330. *Sprengel, Syst. Veg.* iv. 86. *Presl, Tent. Pterid.* 108. *Link, Fil. Sp.* 97. *Sturm, Fl.* (Farrn.) t. 5. *Heufl. Aspl. Eur.* 53.

ASPLENIUM ALTERNIFOLIUM, *Wulfen, Jacq. Miscell. Aust.* ii. 51, t. 5, fig. 2. *Smith, Eng. Bot.* xxxii. t. 2258; *Id., Eng. Fl.* 2 ed. iv. 296. *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Sowerby, Ferns of Gt. Brit.* 56, t. 33.

ASPLENIUM BREYNII, *Retzius, Obs. Bot.* i. 32. *Swartz, Syn. Fil.* 85. *Schkuhr, Krypt. Gew.* 77, t. 81. *Fée, Gen. Fil.* 190. *Nyman, Syll. Fl. Europ.* 482. *Koch, Syn.* 2 ed. 983. *Fries, Sum. Veg.* 82. *Svensk Bot.* t. 534. *Ledebour, Fl. Ross.* iv. 520. *Mettenius, Fil. Hort. Bot. Lips.* 76; *Id., Asplen.* 142.

AMESIUM GERMANICUM, *Newman, Hist. Brit. Ferns*, 2 ed. 10; 3 ed. 258; *Id., Phytol.* 1851, *App.* vii.

ASPLENIUM MURALE, β. *Bernhardi, Schrad. Journ. Bot.* 1799, i. 312.

PHYLLITIS HETEROPHYLLA, *Mœnch, Method.* 724.

SCOLOPENDRIUM ALTERNIFOLIUM, *Roth, Fl. Germ.* iii. 53.

TARACHIA GERMANICA, *Presl, Epim. Bot.* 79.

Caudex short, tufted, thickish, scaly. *Scales* small, narrow lanceolate, dark brown, striato-reticulate. *Fibres* slender, branched.

Vernation circinate.

Stipes terminal and adherent to the caudex, slender, nearly or quite as long as the frond, dark purplish brown below, green above, and as well as the *rachis* smooth.

Fronds from two to six inches high, narrow linear oblong, somewhat broadest at the base, pinnate, subbipinnate, or, when very luxuriant, bipinnate below, palish green, scarcely sub-coriaceous. *Pinnæ* alternate, ascending, remote, the lower ones largest and most

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developed; in small plants narrow-obovate or cuneate, cut into two or three narrow lobes, the lobes simple or toothed, the apex unequally toothed, the base tapering into a kind of petiole; in the larger specimens more distinctly stalked, and sometimes decidedly bipinnate with one distinct cuneate pinnule. The upper pinnæ become less lobed, but are unequally toothed at the apex, which is blunt, and they are falcately curved inwards. The apex of the frond consists of several coalescent smaller narrow lobes.

Venation consisting of from two to four series of furcate divisions of the *vein* which constitutes the vascular bundle of the footstalk; there is no *costa* or midvein, but one of the *venules* extends to each of the teeth, so that the pinnule is occupied by from two to five or six flabellately-forked nearly parallel venules.

Fructification on the back of the frond, occupying all the pinnæ. *Sori* linear elongate, on two or three of the central venules, opening inwardly from each margin, at length confluent. *Indusium* a thin narrow membrane with the margin entire or somewhat wavy. *Spore-cases* obliquely obovate, brown. *Spores* roughish or muriculate, roundish-oblong.

Duration. The caudex is perennial. The plant is evergreen or sub-evergreen, the fronds being more or less persistent

This plant, though almost invariably kept distinct by writers on Ferns, has not unfrequently at the same time and by the same pen been marked as a dubious species, having a supposed relationship either to the Wall Rue, or the Forked Spleenwort. Without doubt it stands intermediate between these two Ferns, but it seems to us perfectly distinct from either of them. The subbipinnate variety of Wall Rue called *cuneatum*, is the only form which at all nearly resembles our present subject, and that is altogether a stouter more coriaceous plant, not lobed as this is, but toothed and having the apical teeth much more uniform. The Forked Spleenwort again is much more coriaceous and less leafy, its lobes being in truth rather rachiform than foliaceous, and its teeth, when present, very different, being rather like distant linear fragments split away from the margin, than serratures, which the few teeth of *Asplenium germanicum* more

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nearly resemble. It appears to be usually found in this country growing sparingly in company with *Asplenium septentrionale*.

This rupestral Fern is one of the rarest of British species, but few stations and in these but few plants having been discovered. There are records of its having been found in North Wales, in the Lake District, in the extreme north of England, and in both the Lowlands and Highlands of Scotland. Mr. Hutchison, who found *A. fontanum* near Stonehaven, has informed us that it is plentiful on rocks almost inaccessible, near Airlie Castle, Forfarshire, but we have seen no specimens from thence. Its altitudinal range has been approximately computed at between 300 and 600 feet above the sea; but it probably reaches at least an elevation of 1000 feet in Wales. The habitats are:—

Peninsula.—Somersetshire: near Culborne, *Miss Payne.*

N. Wales.—Denbighshire: Rocks near Llanrwst (Bwlch-y-Rhyn), *H. Wilson;* between Llanrwst and Capel Curig, *Cyb. Brit.* Carnarvonshire: Moel Lechog, Llanberris, *Mr. Williams.*

Lakes. — Cumberland: Helvellyn, *Rev. W. H. Hawker, F. Clowes;* Borrowdale, *Miss Wright, H. E. Smith.*

Tyne.—Northumberland: Kyloe rocks, *G. R. Tate.*

E. Lowlands.—Roxburghshire: rocks two miles from Kelso on the Tweed, *Dickson;* Minto Crags near Hassendean, *Dr. Nichol.* Edinburghshire: Arthur's Seat (Mr. S. F. Gray has a specimen so labelled); gathered within two miles of Edinburgh 1857, *P. N. Fraser.*

E. Highlands.—Fifeshire: three miles from Dunfermline, *Dr. Dewar.* Perthshire: Stenton rock near Dunkeld, *Dr. McNab;* near Perth, *Mr. Bishop.* ? Forfarshire: near Airlie Castle, *D. Hutchison.*

The Alternate-leaved Spleenwort appears to have been found sparingly throughout northern and central Europe, occurring as far north as Helsingfors in the Gulf of Finland, and passing thence to Norway and Sweden, Belgium, Great Britain, France, Switzerland, and the Tyrol, the Carpathian Mountains, Germany, Hungary, Bukowina, Croatia, Dalmatia, Italy, and Spain. We have no information of its occurrence in other parts of the world.

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This rare Fern is one which does not thrive under cultivation, except with careful management. If potted in porous soil, with the crown well elevated, and covered by an elevated bell-glass in a close shaded frame or cool house or pit, so as to be protected from drip, it will generally grow with tolerable vigour; but the plants are very liable to perish under confinement in winter. The best safeguard is, not to allow water to reach the crowns, and at the same time to keep the roots just moderately moist, and not to suffer the bell-glasses, employed to protect them from the risk of being wetted, to injure them by retaining a constantly damp atmosphere, which they will do if they are kept closed. For open rock culture, where it might be desirable to employ protection from atmospheric changes, the plan of using glasses furnished with a couple of small apertures opposite each other, as vents, near the top, so successfully adopted by Mr. Clowes in cultivating *Hymenophyllum*, would no doubt be found congenial to these shy-growing mountain *Asplenium*s. The plants may be increased by dividing the crowns.

The species is so rare that varieties are scarcely likely to occur in a wild state, and we do not know of any which have been observed. A new form, showing a slight variation from the normal condition, has however been produced in cultivation:—

1. *acutidentatum* (M.) This variety, which is we believe unique, differs from the usual form, in having the teeth of the lobes acute instead of obtuse. It has been raised by Mr. Sim of Footscray, and is an interesting sport. [Plate LXXX B.]

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THE FORKED SPLEENWORT.

ASPLENIUM SEPTENTRIONALE.

A. fronds linear, simple, or two-three-cleft with linear divisions; segments alternate, ascending, elongate and rachiform, with a few deep narrow distant teeth; sori few, elongate, often parallel; indusium entire. [Plate LXXXI.]

ASPLENIUM SEPTENTRIONALE, *Hoffmann, Deutschl. Fl.* ii. 12 (1795). *Hull, Brit. Fl.* 241 (1799). *Smith, Eng. Bot.* xv. t. 1017; *Id., Eng. Fl.* 2 ed. iv. 295. *Gray, Nat. Arr. Brit. Pl.* ii. 14. *Hooker & Arnott, Brit. Fl.* 7 ed. 588. *Babington, Man. Brit. Bot.* 4 ed. 426. *Deakin, Florigr. Brit.* iv. 74, fig. 1595. *Newman, Hist. Brit. Ferns,* 2 ed. 269. *Sowerby, Ferns of Great Brit.* 58, t. 34. *Moore, Handb. Brit. Ferns,* 3 ed. 193; *Id., Ferns of Great Britain Nature Printed,* t. 41 C; *Id., Ind. Fil.* 166. *Hooker, Fl. Lond.* v. t. 162. *Lowe, Nat. Hist. Ferns,* v. t. 3 A. *Bentham, Handb. Brit. Fl.* 633. *Schkuhr, Krypt. Gew.* 62, t. 65. *Willdenow, Sp. Plant.* v. 307. *Svensk Bot.* t. 534. *Sprengel, Syst. Veg.* iv. 81. *Presl, Tent. Pterid.* 106, t. 3, fig. 8. *Koch, Syn.* 2 ed. 983. *Sturm, Fl.* (Farrn.) t. 4. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 521. *Mettenius, Fil. Hort. Bot. Lips.* 76, t. 13, fig. 21; *Id., Asplen.* 141. *Nyman, Syllog. Fl. Eur.* 433.

ASPLENIUM BIFURCUM, *Opiz, Flora,* 1823, 667.

ASPLENIUM FURCATUM, *Jacquemont MS. Hb. Mus. Par.*

ACROSTICHUM SEPTENTRIONALE, *Linnæus, Sp. Plant.* 1524. *Bolton, Fil. Brit.* 12. t. 8. *Fl. Dan.* t. 60.

ACROSTICHUM LACINIATUM, *Gilibert, Exerc. Phytol.* ii. 555.

ACROPTERIS SEPTENTRIONALIS, *Link, Hort. Reg. Berol.* ii. 56; *Id. Fil. Sp.* 80. *Fée, Gen. Fil.* 77, t. 6 A, fig. 1.

AMESIUM SEPTENTRIONALE, *Newman, Hist. Brit. Ferns,* 2 ed. 10; 3 ed. 265; *Id., Phytol.* 1851, *App.* viii.

BLECHNUM SEPTENTRIONALE, *Wallroth, Bluff & Finger. Comp. Fl. Germ.* iii. 24.

BELVISIA SEPTENTRIONALIS, *Mirbel, Hist. Nat. Veg.* iii. 473.

PTERIS SEPTENTRIONALIS, *Smith, Mem. Acad. Turin,* v. 412, in obs.

SCOLOPENDRIUM SEPTENTRIONALE, *Roth, Fl. Germ.* iii. 49.

Caudex short, thick, often tufted, and forming large dense masses of scaly crowns. *Scales* small, narrow, lanceolate, dark brown, striate-reticulate. *Fibres* numerous, wiry, branched.

Vernation circinate.

Stipes terminal, adherent to the caudex, dark brown-purple at the base, green above, as long as or longer than the frond.

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Fronds from two to six inches high, numerous, deep green, coriaceous; sometimes simple, and then either entire, or with a few distant marginal subulate teeth appearing as if split away from the main portion, or divided into two or three narrow-linear alternate ascending lobes; sometimes forked, with the two divisions either simple, toothed, or lobed on the same plan as the simple fronds. The simple fronds are narrow, linear, tapering towards both ends; the forked ones are indefinite in form, and apparently one-sided, one of the divisions being smaller than the other, and looking like a lateral branch without a balancing branch from the opposite side of the rachis. The lobes are sometimes so much separated as to look like distinct pinnæ.

Venation consisting of two or three series of furcate divisions of the *vein* which enters from the base, one of the *venules* extending to each of the teeth, there being no *costa* or midvein.

Fructification on the back of the frond. *Sori* linear, elongate, on the inner side of two or three of the few venules, and opening towards the centre: towards the apices they are often opposite and contiguous almost as in *Scolopendrium*, in consequence of the narrowness of the parts; and being crowded with numerous spore-cases, they sometimes become confluent, and when old appear to be universal as in *Acrostichum;* but these are mere similarities. *Indusium* linear, entire. *Spore-cases* roundish-obovate, dark-brown. *Spores* roundish-oblong, slightly muriculate.

Duration. The caudex is perennial. The fronds are persistent; the plant is, therefore, an evergreen.

This species may be distinguished at first sight by its tufted grassy aspect. From its ally *Asplenium germanicum*, which some botanists would consider a variety of it, the Forked Spleenwort may be known by its fronds being either simple with mere lobes, or forked with two distinct branches, each like its own smaller fronds, and never being regularly pinnate as is *Asplenium germanicum*. It is also narrower in its parts, with the texture thicker, and less leafy.

A rare species, but widely distributed, being found in Somerset and Devon, in North Wales, in the Lake District, in Yorkshire

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and Northumberland, in Roxburghshire, about Edinburgh, in Perthshire, and at the Pass of Ballater in Aberdeenshire, which is the most northerly station yet certified, though it has been reported from Orkney, as it also has from Forfarshire. It reaches an elevation of upwards of 3000 feet, and descends nearly to the sea level in North Wales. It does not appear to occur at all in Ireland. The situations in which it is found are fissures of rocks, and the interstices of loose stone walls. The recorded habitats are :—

Peninsula.—Somersetshire: near Culborne, *N. B. Ward;* near Oare Church, *Rev. W. S. Hore;* wall on Exmoor, four miles from Porlock, *R. J. Gray.*

Thames.—? Kent: Bocton Hill.

Humber.—Yorkshire: Ingleborough.

Tyne.—Northumberland: Kyloe Crags.

Lakes.—Cumberland: Honister Crags; Scawfell; Patterdale; Keswick; ravine near Wastwater; Borrowdale, *Miss Wright;* Vale of Newlands; Helvellyn, *Rev. W. H. Hawker.* Westmoreland: Ambleside.

N. Wales.—Denbighshire: Llan Dethyla, near Llanrwst, *Dr. Richardson;* Nant-Bwlch, near Llanrwst, a short cut from Llanrwst to Capel Curig, *W. Wilson.* Carnarvonshire: about a mile from Llanrwst on the Conway Road, *E. Newman;* Craig Dhu, Pass of Llanberris, *S. O. Gray;* rocks near Llyn-y-cwm, between Llanberris and Lyn Idwal; on Moel Lechog; rocks near Bettwys-y-Coed; Pont-y-Pair, Capel Curig; Carnedd Llewellyn, &c.

E. Lowlands.—Roxburghshire: Minto Crags; Jedburgh. Edinburghshire: Arthur's Seat; Samson's Ribs; Blackford Hill; and other places in the neighbourhood of Edinburgh.

E. Highlands.—Perthshire: Stenton Rocks, near Dunkeld. ? Forfarshire. Aberdeenshire: Pass of Ballater, *A. Tait.*

N. Isles.—? Orkney.

This is a not uncommon European plant, occurring abundantly in some of the mountainous tracts of central Europe, and extending from Scandinavia and Russia, through Great Britain, France, Belgium, Switzerland, Germany, Hungary, Croatia, and Transyl-

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vania, to Spain, Portugal, and Italy. In Asia, it is found in Northern India, at Kashmir, Kumaon, Kunawar, and Gurwhal; in the region of the Caucasus; and in the mountain ranges of the Ural and the Altai in Siberia. It occurs also in New Mexico!

As in the case of the allied species, many persons fail to cultivate this Fern with success. The failure probably arises from the use of fine soil in too large masses. Naturally this is a rupestral plant, and this condition should be imitated by its being planted among masses of porous sandstone, in the interstices of which only, a little sandy soil should be placed. It would no doubt be also an advantage to plant somewhat horizontally rather than too strictly vertical; and to allow the upper fragment of stone employed, to be large enough to serve as a shade to the crown from the sun's rays, these latter in summer acting too powerfully on the soil contained in small pots. This amount of shade would admit of the plants being kept in a more exposed situation than is usually safe, from the cause just referred to; and thus the evils arising from close dampness and want of ventilation would be remedied. The exposure, however, must be modified judiciously: for instance, a greenhouse where the atmosphere is dried and moistened daily, would probably be found congenial; or a cold frame, well aired and slightly shaded, might with advantage be substituted for the closer frame and denser shade, which is more usual. Certainly many Ferns do not need so much shade as is given in a general collection, to suit the more tender kinds; and the partial shade afforded by a lump of stone on the sunny side of the crown of a small Fern would be more congenial to many of the mural or rupestral species, than a more general exclusion of the sun's rays. Mr. Watson has noticed that the young fronds are easily damaged by frost.

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Genus VIII: **SCOLOPENDRIUM,** *Smith.*

Gen. Char.—**Sori** indusiate, linear, often elongated, approximate in parallel and opposite pairs face to face; **receptacles** situated on the anterior and posterior sides of venules belonging to adjacent fascicles of veins. **Indusium** linear, plane, membranaceous, twin, each part opening on its exterior side with reference to the fascicle to which it belongs, so that the twin sorus opens along the centre. **Veins** forked from a central costa; **venules** direct, parallel, normally free, terminating within the margin in club-shaped apices.

Fronds thick herbaceous, simple or pinnate, frequently and variously undulate lobate ramose multifid marginate cornute or lacerate, sometimes much depauperated.

Caudex short, stoutish, erect or decumbent.

The *Scolopendrium* or Hart's Tongue Fern, forms a sub-group of the *Aspleniæ*, in which the sori instead of being simple and distinct, are brought together in opposite pairs, so that what appears to be a line of spore-cases forming a sorus, is in fact a double line forming a double or twin sorus. This peculiarity of structure is not confined to the simple-fronded species inhabiting Great Britain, but occurs also in certain pinnately-divided exotic species, and may therefore be considered as of sufficient importance to be employed for the purpose of generic distinction.

The veins in the genus *Scolopendrium* issue from the main rib or costa alternately, each one being once or twice divided near the base in a dichotomous manner, so as to form a tuft or fascicle of from two to four long parallel venules along the side of some of which the spore-cases are produced. It is not however to different venules of the same fascicle that the two parts of the twin sorus are attached, but to the exterior venules of contiguous fascicles. Thus the posterior venule of one tuft or group of veins, bears along its hinder side a simple sorus, and the anterior venule of the group next behind

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it, bears on its anterior side another simple sorus, these branches of the veins being sufficiently near together to admit of the indusium of the one, meeting the indusium of the other, and thus a double or twin sorus is produced. In the earlier stages, the two indusia do thus meet, the edge of the one overlying that of the other, but as the parts hidden beneath them increase in size, they are gradually lifted up and at length forced asunder, becoming ultimately turned backwards in opposite directions by the enlarging mass of spore cases, which become blended into one broad linear mass.

We have formerly* pointed out, that although the fructification of *Scolopendrium* is normally dorsal, as in the rest of the *Polypodiaceæ*, a very curious deviation from this law, occurs in several of the varieties of the common Hart's Tongue Fern, the sori being produced on the upper as well as the lower surface, and sometimes abundantly so. This occasionally happens from the elongation of the normally placed sorus of the underside, which extends to the margin and returns on the upper side when the sori happen to be placed opposite to the marginal crenatures. But it also frequently happens that the sori are produced on the upper side distinctly within the margin, and where there are no corresponding sori beneath. Those varieties which have the margin crenated or lobed, seem most liable to assume this abnormal suprasoriferous condition. The same kind of deviation from the normal structure has since been observed to occur in a few other ferns: as in the *Polypodium anomalum* of Ceylon, described by Sir W. J. Hooker,† in which the sori are uniformly on the upper surface; in a specimen of *Asplenium Trichomanes* gathered in Italy by E. W. Cooke, R. A., in which besides the copious fructification of the under surface, one of the pinnæ bore a solitary but complete sorus on its upper surface; and in the *Cionidium Moorii* of New Caledonia,‡ in which the sori, normally extra marginal, are sometimes scattered also over both surfaces. The Rev. M. J. Berkeley in noticing the curious *Polypodium anomalum*, referred to above, which had been hesitatingly supposed to be an abnormal condition of *Polystichum vestitum*

* Moore, *Ferns of Great Britain Nature Printed*, folio ed., under t. 42.
† Hooker, *Kew Journal of Botany*, viii. 360, t. 11.
‡ Moore, *Journal of Proceedings of Linnæan Society*, ii. 129.

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observes:* "there is no doubt that the sori are really produced on the upper side, and that the frond is not reversed, like the leaves of *Alstrœmeria* or the laciniæ of *Schizæa*, as the structure of the soriferous side is essentially that of the upper and not of the under side." We can only, from these instances, draw the inference that there exists in the vascular system of ferns, a proliferous power, which may be developed in any direction.

The common native *Scolopendrium* is one of the most remarkably prolific of varieties or variations, among known ferns; the greater part of these, though not unfrequently altogether monstrous in their development, retaining their peculiarities under cultivation. Several forms very distinct in themselves, and distinct also from the parent, have been produced from the spores under artificial treatment; and we cannot doubt from these instances that the same process is going on, more slowly indeed and less perceptibly but with equal certainty, in a state of nature, giving rise to new forms, a proportion of which endure on, and become perpetuated.

The normal condition of the veins in *Scolopendrium* is to lie in parallel-forked lines, branching at the base but not uniting upwards. This normal arrangement is sometimes disturbed in varieties which assume a distinctly abnormal character, the tissues becoming irregularly contracted, and the order of the venation deranged, so that the venules here and there unite to form an irregular reticulation. Some forms become very much affected in this way, their venules becoming generally reticulated.

The name *Scolopendrium* has met with the general approval of pteridologists. It has been however latterly objected to by Mr. Newman, who proposes to substitute that of *Phyllitis*, on the ground that the former name having been originally applied by Linnæus as a specific appellation, it is not competent to be used as a generic title. We are unable to discover any force in this objection, which is, moreover, negatived by the practice of botanists.

The pinnated species of Hart's Tongue Fern are found in South Africa, the Philippine Islands, and the Islands of the Pacific Ocean; and one or two simple fronded species, besides our native one, are also found in extra-Europæan habitats.

* Berkeley, *Introduction to Cryptogamic Botany*, 509, note.

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The name is derived from that of *Scolopendra*, a genus of myriapods, and is applied in allusion to the lines of fructification, which resemble the many legs of these crawling animals.

BRITISH SPECIES AND VARIETIES.

S. vulgare: a perennial, with simple strap-shaped fronds, cordate at the base; very prolific of varieties.

(*a*) *Fronds strap-shaped.*

var. **gymnocorum**: fronds narrow, truncate at the base, the apex lobate, the margin repand and toothed; sori and veins very oblique; indusium usually abortive.

var. **sagittifolium**: fronds oblong, attenuate or lobate at the apex, the base sagittate.

var. **cornutum**: fronds crenate or lobate on the margin, usually obtuse, the midrib excurrent below the apex, forming a horn; fertile.

var. **polyschides**: fronds narrow, the base sub-truncate, the margin lobed and irregularly crenate; fertile.

var. **marginatum**: fronds narrowish, the base truncate, the margin inciso-lobate, producing an excurrent lobed fertile free membrane on the under surface; fertile.

var. **muricatum**: fronds oblong, slightly sinuous or lobed, the upper surface ridgy, with raised points.

var. **crispum**: fronds broad-oblong, the base strongly auriculate-cordate, the margin much undulated; usually barren.

var. **variabile**: fronds oblong, rounded or lobate at the apex, the margin sometimes with one or more rounded lobes; stipes often bearing a distinct reniform lobe.

(*b*) *Fronds multifid or ramose.*

var. **multifidum**: fronds irregular, furcately multifid-crisped at the apex; stipes undivided; very variable and including numerous sub varieties; fertile.

var. **ramosum**: fronds irregular, the apex densely multifid-crisped; stipes branched.

var. **laceratum**: fronds broadly ovate, sometimes strap-shaped, subundulate, deeply inciso-lobate, the lobes prolonged, the apex and sometimes also the pair of enlarged basal lobes multifid-crisped.

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THE COMMON HART'S TONGUE FERN.

SCOLOPENDRIUM VULGARE.

S. fronds (normal) broadly-linear or oblong strap-shaped, entire, attenuate at the apex, cordate at the base, smooth or slightly hair-scaly on the midrib beneath; stipes shaggy, with narrow membranous scales. [Plate LXXXII.]

SCOLOPENDRIUM VULGARE, *Smith, Mem. Acad. Roy. Sc. Turin*, v. 421, t. 9, fig. 2 (1790); *Id., Eng. Bot.* xvi. t. 1150; *Id., Eng. Fl.* 2 ed. iv. 301. *Symons, Synop. Pl.* 193 (1798). *Gray, Nat. Arr. Brit. Pl.* ii. 14. *Curtis, Fl. Lond.* i. t. 119. *Mackay, Fl. Hib.* 342. *Bentham, Handb. Brit. Fl.* 634. *Lowe, Nat. Hist. Ferns*, v. t. 55. *Hooker & Arnott, Brit. Fl.* 7 ed. 590. *Babington, Man. Brit. Bot.* 4 ed. 427. *Deakin, Florigr. Brit.* iv. 78, fig. 1598. *Newman, Hist. Brit. Ferns*, 2 ed. 289. *Moore, Handb. Brit. Ferns*, 3 ed. 197; *Id., Ferns of Gt. Brit. Nature Printed*, t. 42, fig. 1 (small). *Sowerby, Ferns of Gt. Brit.* 59, t. 35. *Nyman, Syllog. Fl. Europ.* 433.

SCOLOPENDRIUM OFFICINARUM, *Swartz, Schrad. Journ. Bot.* 1800, ii. 61; *Id., Syn. Fil.* 89. *Schkuhr, Krypt. Gew.* 78, t. 83. *Willdenow, Sp. Plant.* v. 348. *Sprengel, Syst. Veg.* iv. 69. *Presl, Tent. Pterid.* 119, t. 4. fig. 15. *Hooker, Gen. Fil.* t. 57 B. *Link, Fil. Sp.* 86. *Koch, Syn.* 2 ed. 984. *Fries, Sum. Veg.* 83. *Ledebour, Fl. Ross.* iv. 522. *Fée, Gen. Fil.* 209. *Gray, Bot. North. United States*, 626. *Mettenius, Fil. Hort. Bot. Lips.* 67.

SCOLOPENDRIUM PHYLLITIS, *Roth, Fl. Germ.* iii. 47.

SCOLOPENDRIUM OFFICINALE, *De Candolle, Fl. Franç.* ii. 552. *Desvaux, Ann. Soc. Lin. Par.* vi. 282.

SCOLOPENDRIUM LINGUA, *Cavanilles, Prælect.* (*Generos y Especies de Plantas demostradas en las Lecciones Publicas*, 1801), 253.

SCOLOPENDRIUM MINUS, *Fée, Gen. Fil.* 209, t. 17 D fig. 3 (a small variety).

SCOLOPENDRIUM SCOLOPENDRIUM, *Newman, Phytol.* 1851, *App.* vi., in obs.

ASPLENIUM SCOLOPENDRIUM, *Linnæus, Sp. Plant.* 1537. *Bolton, Fil. Brit.* 18, t. 11. *Svensk, Bot.* t. 143.

ASPLENIUM ELONGATUM, *Salisbury, Prod.* 402.

BLECHNUM LINGUIFOLIUM, *Stokes, Bot. Mat. Med.* iv. 616.

PHYLLITIS SCOLOPENDRIUM, *Newman, Hist. Brit. Ferns*, 2 ed. 10; 3 ed. 271; *Id., Phytol.* 1851, *App.* vi.

Var. **gymnosorum**: fronds narrow, strap-shaped, truncate below, lobate at the apex, the margin repand and toothed; veins and sori forming an acute angle with the costa; indusium usually abortive.

Var. **sagittifolium**: fronds oblong, strap-shaped, attenuate, sometimes lobate at the apex, the base sagittately lobed.

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SCOLOPENDRIUM VULGARE, *v.* SAGITTIFOLIUM, *Wollaston MS. Moore, Ferns of Gt. NBrit. ature Printed*, under t. 42.

Var. **cornutum**: fronds strap-shaped, the margin crenated or lobate, the apex usually obtuse, the midrib excurrent below it, forming a horn projecting from the surface. [Plate LXXXIV B.]

SCOLOPENDRIUM VULGARE, *v.* CORNUTUM, *Moore, Ferns of Gt. Brit. Nature Printed*, under t. 42; *Id., Handb. Brit. Ferns*, 198.

Var. **polyschides**: fronds narrow strap-shaped, or linear-oblong, subtruncate at the base, the margin distantly lobed, and irregularly crenate; fertile. [Plate LXXXIII A.]

SCOLOPENDRIUM VULGARE, *v.* POLYSCHIDES, *Gray, Nat. Arr. Brit. Pl.* ii. 15. *Moore, Handb. Brit. Ferns*, 3 ed. 198; *Id., Ferns of Gt. Brit. Nature Printed*, t. 42, fig. 2. *Deakin, Florigr. Brit.* iv. 79, fig. *a*. *Sowerby, Ferns of Gt. Brit.* 60.

SCOLOPENDRIUM VULGARE, *v.* ANGUSTIFOLIUM, *of gardens.*

SCOLOPENDRIUM OFFICINARUM, *v.* ANGUSTIFOLIUM, *Kunze, Lin.* xxiii. 291. *Metenius, Fil. Hort. Bot. Lips.* 67.

SCOLOPENDRIUM PENNSYLVANICUM, *of gardens;* according to Kunze.

SCOLOPENDRIUM VULGARE, *v.* LINEARE, *Francis, Anal. Brit. Ferns*, 4 ed. 52.

PHYLLITIS POLYSCHIDES, *Ray, Synop.* 117.

Var. **marginatum**: fronds narrow-oblong strap-shaped, truncate at the base; attenuate at the apex, the margin inciso-lobate; fertile; the epidermis of the under surface also developed near the margin into a lobed excurrent membrane, which bears sori on both surfaces. [Plate LXXXVI A.]

SCOLOPENDRIUM VULGARE, *v.* MARGINATUM, *Moore, Handb. Brit. Ferns*, 2 ed. 174; 3 ed. 198; *Id., Ferns of Gt. Brit. Nature Printed*, t. 42, fig. 3.

Var. **muricatum**: fronds oblong strap-shaped, the margin slightly lobed or sinuous, the upper surface unevenly ridged, the ridges oblique and bearing raised or excurrent points.

SCOLOPENDRIUM VULGARE, *v.* MURICATUM, *Moore, Ferns of Gt. Brit. Nature Printed*, under t. 42; *Id., Handb. Brit. Ferns*, 3 ed. 208.

Var. **crispum**: fronds broadly oblong strap-shaped, the margins much undulated, the base strongly auriculate cordate; usually barren. [Plate LXXXIII B.]

SCOLOPENDRIUM VULGARE, *v.* CRISPUM, *Gray, Nat. Arr. Brit. Pl.* ii. 15. *Moore, Handb. Brit. Ferns*, 3 ed. 198; *Id., Ferns of Gt. Brit. Nature Printed*, t. 42, fig. 4. *Sowerby, Ferns of Gt. Brit.* 60. *Deakin, Florigr. Brit.* iv. 78.

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SCOLOPENDRIUM OFFICINARUM, *v.* CRISPUM, *Willdenow, Sp. Plant.* v. 349. *Link, Fil. Sp.* 86. *Mettenius, Fil. Hort. Bot. Lips.* 67.
PHYLLITIS CRISPA, *J. Bauhin, Hist. Plant.* iii. 749.

Var. **variabile**: fronds oblong strap-shaped, rounded or sometimes lobate at the apex, the margin often divided to the costa into one or more rounded or subreniform lobes; stipes frequently bearing a distinct reniform lobe; rarely the entire frond consists of two kidney-shaped opposite stalked branches. [Plate LXXXVIII.]

SCOLOPENDRIUM VULGARE, *v.* VARIABILE, *Wollaston MS. Moore, Ferns of Gt. Brit. Nature Printed*, under t. 42; *Id., Handb. Brit. Ferns*, 3 ed. 207.

Var. **multifidum**: fronds irregular, many-times furcately divided near the apex, the divisions variously multifid-crisped; fertile; stipes undivided. [Plate LXXXIX.]

SCOLOPENDRIUM VULGARE, *v.* MULTIFIDUM, *Gray, Nat. Arr. Brit. Pl.* ii. 15. *Moore, Handb. Brit. Ferns*, 3 ed. 198; *Id., Ferns of Gt. Brit. Nature Printed*, under t. 42 (excl. the vars. *ramosum & lobatum*). *Sowerby, Ferns of Great Brit.*, 61.
SCOLOPENDRIUM OFFICINARUM, *v.* MULTIFIDUM, *Schkuhr, Krypt. Gew.* 79, t. 83, fig. *b*. *Willdenow, Sp. Plant.* v. 349. *Link, Fil. Sp.* 86.
PHYLLITIS MULTIFIDA, *Gerard; Ray, Synop.* 117.

Var. **ramosum**: stipes branched; fronds irregular, short, dense; the branches plane below, densely multifid-crisped at the apex.

SCOLOPENDRIUM VULGARE, *v.* RAMOSUM, *Gray, Nat. Arr. Brit. Plants* ii. 15. *Moore, Handb. Brit. Ferns*, 3 ed. 199.
SCOLOPENDRIUM VULGARE, *v.* DÆDALEUM, *Deakin, Florigr. Brit.* iv. 79, fig. *c*.
SCOLOPENDRIUM OFFICINARUM, *v.* RAMOSUM, *Willdenow, Sp. Plant.* v. 350. *Link, Fil. Sp.* 86.

Var. **laceratum**: fronds broadly ovate (sometimes on the same plant strap-shaped), the margin more or less undulate deeply inciso-lobate; lobes unequally prolonged, the apex multifid-crisped; basal pair of lobes sometimes much elongated and multifid-crisped at the end. [Plate XCII.]

SCOLOPENDRIUM VULGARE, *v.* LACERATUM, *Moore, Handb. Brit. Ferns*, 2 ed. 175; 3 ed. 199; *Id., Ferns of Gt. Brit. Nature Printed*, t. 42, fig. 10. *Sowerby, Ferns of Gt. Brit.* 61.
SCOLOPENDRIUM VULGARE, *v.* SERRATUM, *of gardens.*
SCOLOPENDRIUM VULGARE, *v.* PALMATUM, *of gardens.*
SCOLOPENDRIUM VULGARE, *v.* ENDIVIÆFOLIUM, *of gardens.*

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Caudex short, thick, tufted, often decumbent, scaly at the crown. *Scales* lanceolate-acuminate, pale purplish-brown, shining, finely reticulate-venose. *Fibres* short, branched, numerous, dark brown.

Vernation circinate.

Stipes averaging about one-third the length of the frond, but varying from about one-fourth to one-half its entire length, usually clothed with pale tawny contorted subulate scales, sometimes smooth, purplish-brown, darkest at the base; terminal, and adherent to the caudex. *Rachis*, or more correctly *midrib*, stout, scaly behind when young, often dark-coloured below.

Fronds from about four inches to two feet or upwards in length, narrow elongate-lanceolate, or broadly linear, or oblong strap-shaped, plane, fleshy or coriaceous, deep rich green; they are normally entire or but slightly sinuous on the margin, the apex more or less attenuated terminating in an acute point, and the base cordate. The varieties deviate in unnumbered forms, by the laceration or undulation of the margin, by the production of an excurrent membrane from either surface, by the multifid dilatation of the apex, by the branching (once or repeatedly) of the stipes and midrib, by the loss of the lobes forming the heart-shaped base or their acute prolongation so as to resemble the barbs of an arrow, and by the arrest of longitudinal development. Sometimes fronds are produced, which are reduced to mere awl-shaped bodies, representing the stipes and costa, everything else being suppressed.

Venation parallel-forked: that is, the *veins* which spring from the stout *costa* or midrib, which is scaly behind when young, and often dark-coloured in the lower part, are one two or three times forked near their base; and the *veinlets* or branches thus produced are parallel, extending side by side obliquely almost to the margin, where they terminate in club-shaped apices. In the cordately enlarged base of the frond, the furcations are more numerous.

Fructification dispersed over the back of the frond, most abundant upwards; sometimes borne on the upper surface. *Sori* linear, oblique, unequal in length, double or twin, that is, growing in pairs, the two contiguous parallel lines of spore-cases borne on the posterior and anterior veinlets of adjacent fascicles of veins, becoming confluent into one broad linear mass, forming a double sorus. *Indu-*

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sium also double, narrow, entire, the two membranes belonging to the two lines of spore-cases set face to face, at first conniving or overlapping each other, but at length separating and becoming finally pushed back in opposite directions and hidden by the crowded mass of spore-cases. *Spore-cases* numerous, obovate, reddish-brown. *Spores* roundish or oblong, muriculate.

Duration. The caudex is perennial. The fronds are persistent, the first young ones being produced about April, and others later in the year, all remaining until long after fresh ones are produced to succeed them; the plant is therefore strictly evergreen.

The common Hart's-Tongue in its normal state is at once known from all other British Ferns by its long strap-shaped succulent-looking deep-green fronds; and technically by its linear twin sori; and many of its varieties retain sufficient of its general aspect to enable those who are at all acquainted with the British Ferns to recognise at a glance their relationship to the specific type. But the varieties are almost endless, and sometimes so completely lose all resemblance to the common state of the plant that a tyro might well be excused for want of faith in their specific identity. Nevertheless some of the most remarkable of these have been artificially produced from other aberrant forms in which the relationship was still evident, and they remain in the hands of the cultivator as monuments of that plastic force in nature which gives origin to new forms of vegetable life, *some* of which doubtless become permanent, overcoming the accidents and the chances of the conditions which surround them, and destined eventually to be recognised as distinct, their origin being often unsuspected. Those of these unnumbered forms which we have thought deserving of botanical recognition are to be considered rather as types of variation than as individual forms, most of them comprising a series of analogous subvarieties.

This beautiful sylvestral species is generally dispersed over the United Kingdom; affording, as Mr. Watson remarks, a very decided example of a prevalent condition of distribution which may be traced in the greater number of British plants, namely, a tendency to linger along the coast line to a higher northern latitude than that

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at which the plant will exist in inland situations. It ascends from the coast to an altitude of from 500 to 600 feet, and though widely dispersed and abundant in some situations, is scarcely to be considered a common Fern. It occurs more sparingly in Scotland than in England, and is again more abundant in Ireland and the Channel Isles. The Hart's-Tongue is a highly ornamental plant, delighting to grow in moist shady hedge banks, amongst underwood, and found also on rocks and on damp masonry, such as the ruins of old bridges or aqueducts, or in the mouths of old wells or caverns, covering the surface with its drooping fronds which form a

"Dark green frill of long lank weeds."

Though not a maritime species, its recorded stations in the northern provinces are mostly on or near the coast line; and it does not appear to be met with inland in the glens or valleys of the Highlands, where the humid climate and sheltering rocks would seem to be well adapted to its growth, and where the general vegetation is similar to that of Orkney and Shetland, in which it is found. The number of variations which occur is remarkable; and though they are often found either solitary, or but few together, yet they are for the most part permanent and easily propagated, so that they become perpetuated in gardens where they are highly ornamental objects. The Channel Islands, Devonshire, Somersetshire, Sussex, and Ireland, seem to be most prolific of remarkable varieties. The following sketch of the distribution of this species will indicate its range; but it is too generally diffused to admit of anything like a complete record of habitats being given:—

Peninsula.—Cornwall: Enys Penryn, *G. Dawson.* Devonshire: Bideford; Marwood, *Rev. F. Mules.* Somersetshire: Nettlecombe, *C. Elworthy;* Selworthy; Frenchay, near Bristol, *T. H. Thomas;* Banwell, *Rev. W. M. Hind.*

Channel.—Hampshire: Fareham. Isle of Wight. Sussex: Littlehampton, *G. B. Wollaston;* Findon, *T. M.;* Arundel, *T. M.* Dorsetshire: Glanville's Wootton, *G. B. Wollaston.* Wiltshire.

Thames.—Hertfordshire. Middlesex: Twickenham, Hounslow, &c. Kent: Sturry, *T. M.* Surrey: Barnes Common; Wimbledon

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Common, *G. Francis;* Albury, *E. Morse;* Hogsback, Guildford, *T. M.* Berkshire. Buckinghamshire: Littleworth, *T. Cox.* Oxfordshire: Chassleton, *H. Buckley.* Essex.

Ouse.—Suffolk. Norfolk. Cambridgeshire. Bedfordshire. Huntingdonshire. Northamptonshire.

Severn.—Warwickshire. Gloucestershire: Stroud. Monmouthshire: Trevddun; Twyn-gwyn, *T. H. Thomas.* Herefordshire. Worcestershire. Staffordshire. Shropshire: Hawkstone.

Trent.—Leicestershire: near Braunston, *Rev. A. Bloxam.* Nottinghamshire. Derbyshire: Buxton, Matlock, Dovedale, *H. C. Watson.*

Mersey.—Cheshire: Congleton. Lancashire.

Humber.—Yorkshire: Edlington, near Adwick; magnesian limestone rocks near Doncaster; Pottery Car, *S. Appleby;* Heckfall Woods, *T. Simpson;* Coninbrough Cliffs; Settle, *A. Clapham;* Leeds, *H. Denny;* Richmond, *J. Tatham.*

Tyne.—Northumberland. Durham: Sunderland.

Lakes.—Cumberland: Whitehaven. Westmoreland. Isle of Man, *E. Forbes.*

S. Wales.—Brecknockshire: Brecon. Pembrokeshire: Castle Malgwyn, *W. Hutchison.* Glamorganshire: Southerndown, *T. H. Thomas.* Carmarthenshire: Dynevor Castle.

N. Wales.—Anglesea: Carreg Onan; Mill Dingle, Beaumaris; Castell Aber, Lleiniog, *Rev. W. A. Leighton.* Denbighshire: Ruthin, *T. Pritchard;* Denbigh; Wrexham, *J. E. Bowman.* Carnarvonshire: Carnarvon Castle; open vault in Conway Castle (fronds three feet long and four inches wide), *C. Johnson.*

W. Lowlands.—Dumfries-shire: Drumlanrig, *G. P. London;* banks of the Glen Water, near Dumfries, *Dr. Lindsay;* Bridge at Annan, *H. G. Johnson.* Kirkcudbrightshire. Wigtonshire. Ayrshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Edinburghshire: Arniston Woods, *W. Brand;* interior of the roof of Roslin Chapel, *H. G. Johnson.* Berwickshire.

E. Highlands.—Stirlingshire: near Stirling, rare, *Mrs. Macleod.* Fifeshire. Forfarshire. Kincardineshire, *Dr. Murray.* Aberdeenshire, not common, *Dr. Murray.* Nairnshire: Cawdor Woods, *W. Stables.* Morayshire: *Rev. G. Gordon.*

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W. Highlands.—Argyleshire: Poltalloch, *G. P. London.* Isles of Islay, Cantyre, and Skye.

N. Highlands.—Sutherlandshire, not common, *Dr. Murray.*

N. Isles.—Isle of Ronsay, Orkney, rare, *R. Heddell.* Shetland.

Ulster.—Antrim: Colin Glen, Belfast, Donegal, *R. Barrington.*

Connaught.—Arran Isles. Galway: Connemara; Gort. Sligo: in the neighbourhood of the town of Sligo, abundant, *E. Newman;* Lough Gill, *R. Barrington.* Leitrim: Manor Hamilton, *R. B.* Mayo: Westport, *R. B.*

Leinster.—Dublin: near Carrickmines, *R. Barrington.* Louth: Townley Hall, *C. L. Darby.* Wicklow. King's County. Kilkenny: Kilmoganny, *J. R. Kinahan.*

Munster.—Cork. Kerry: Mucruss, Killarney, abundant, *E. Newman.* Waterford, *J. R. Kinahan.* Tipperary, *J. R. K.* Clare: Black Head, *R. Barrington.* Limerick.

Channel Isles.—Jersey. Guernsey.

The northern limit of this Fern is reached, according to Fries, in Gothland, an island of the Baltic, the Scandinavian peninsula being avoided; but it occurs in some of the central provinces of European Russia, and thence through the countries of central Europe, *e.g.* Great Britain, Holland, Belgium, France, Switzerland, and Germany, to Spain, Portugal, Italy, Dalmatia, Greece, and Turkey. In Africa it is found in Algeria, and in the Atlantic Islands of Madeira, and the Azores. In Asia it occurs, according to Ledebour, in the Caucasus, on the Siberian side of the Ural Mountains, and in Turcomania; and it is also found in Asia Minor, at Erzeroum, and in Northern Persia. In the Hookerian collection is a specimen doubtfully labelled, from Kumaon. The species is indigenous to the Northern United States, but is there apparently rare. The *Scolopendrium Lindeni* of Hooker from Mexico, seems to differ only in its narrowed fronds, having the same strap-shaped outline, entire margin, cordate base, and shaggy stipes and midrib, as in the common European plant, of which it may perhaps be regarded as a diminished variety. The *Scolopendrium Hemionitis* and *sagittatum* of the south of Europe, though generally held distinct, may be only marked varieties of the common Hart's-Tongue; indeed, if these are

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kept separate, those native forms in which the cordate or auriculate base is entirely wanting, seem equally deserving of separation.

Sir J. E. Smith mentions that the whole plant when bruised has a nauseous scent, and that it is mucilaginous and acrid to the taste. Medicinal virtues were formerly attributed to it, but these are now disregarded. Thus it is said to have been formerly used boiled in red wine as an astringent in cases of diarrhœa, dysentery, &c., not only in this country but also on the continent. It was also employed, especially by country herbalists, and in the domestic pharmacopœia, in the preparation of an ointment for healing wounds and ulcers, or according to Lightfoot, as a vulnerary for scalds and burns. Mr. Newman mentions* that the late Lady Greenly, of Titley Court, Herefordshire, took great pains to introduce and cultivate an evergreen fern called Dail llosg y Tân, as a remedy for burns, and that accredited specimens of this fern received from Lady Hall of Llanover, by Mr. Beynon, proved to be the common Hart's-Tongue.

Few native ferns are more desirable than this for the garden; and no fern rockery should be without a large proportion of its varied forms. Its boldness of character even in the normal state, its deep verdure when in health, and its almost endless variety, especially recommend it to the notice of cultivators, at whose hands, moreover, it seeks no special care; for it is rather a free-growing plant than otherwise, preferring humid shady places, with a well drained soil, a sandy loam mixed with a small proportion of peat and sand, according to the circumstances of individual cases, being the preferable earth for its roots. In pots the same kind of compost answers very well indeed, provided drainage is properly attended to. It does not succeed so well in a town atmosphere as where the air is pure, but wherever this desideratum can be secured few ferns grow more satisfactorily. It is also a very good fern for a cool house or pit, in which it will generally thrive. We find it however exceedingly liable to be attacked by the grub of a kind of weevil, which feeds on the caudex, and if not timely discovered destroys the plant. Several

* Newman, *History of British Ferns*, 3 ed. 275.

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of the varieties are proliferous, and may be increased by means of their buds. The plants may also be divided when the crowns are double; or the varieties may be propagated by cuttings of the succulent bases of the decayed fronds, a mode of increase discovered by Mr. C. Jackson.* The fleshy bases of the stipes which are the parts made use of, remain alive long after the fronds have decayed; these are cut asunder with a sharp knife, retaining a portion of the rind of the caudex, and planted like root cuttings in a slight warmth, and under these conditions they soon organise buds from the cut edges, and so form young plants.

None of the British Ferns have proved so prolific of varieties as the Hart's-Tongue, of which indeed the forms seem endless. We have already indicated several of these, which may be taken as the types of a series of other variations, the greater part of which are now proved to be permanent, and a large proportion of which are distinct enough to serve the purpose of the cultivator. One of the most curious deviations from the normal state, is that in which the sori are usually without the ordinary covers to the spore-cases; this must be considered as a case of abortion. There are other forms in which the margin is variously cleft or toothed or lobed, the variations of these peculiarities being numerous; while some are crisped or curled along the margins; others sagittate at the base; some furnished with an excurrent membrane on the under or sometimes on the upper surface; others have the upper surface variously muricate or warty; some have the costa growing out into a horn; and numerous others again have the tips of the fronds variously multifid and cristate, and the stipites variously ramose. These forms, so far as they have been recognised, we shall enumerate in their several series. The arrangement we have followed is quite artificial, many of the forms being so composite in character that they belong equally to more than one group. In such cases we have placed them in the group or series with which they seem to have most affinity, and have repeated the names under the other series to which the plants are referrible.

The forms of the Hart's-Tongue Fern are mostly permanent, and as they prove to be easily cultivated, they are much prized as

* Moore, in *Gardeners' Chronicle*, 1856, 132.

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garden ornaments on account of their variety of form and their cheerful hue. Indeed, a collection of *Scolopendriums* alone might be made sufficiently extensive to engage the interest of many an amateur cultivator, and yet thoroughly free from anything like monotony of character, though originating from one which in its normal state is the most simple among British Ferns. This fact will account for the large number of them which have been received as garden plants under distinctive names, and which we shall briefly notice and endeavour to distinguish. Many of the following notes were obligingly drawn up and communicated for our folio edition by Mr. G. B. Wollaston, of Chislehurst, whose own collection of living plants contains one of the most extensive series of these varieties. We have also to acknowledge the receipt of very ample materials from the rich collections of Sir W. C. Trevelyan, Bart., of Nettlecombe; Mr. A. Clapham of Scarborough; Mr. J. James, of Vauvert, Guernsey; the Rev. J. M. Chanter, of Ilfracombe; and Mr. C. Jackson, of Barnstaple.

Gymnosorum Series.

1. *gymnosorum* (M.). This is a dwarf variety, growing about six inches high, and having narrow fronds, which are truncate at the base, multifidly lobed at the apex, and somewhat repand on the margin, with small uneven teeth, or occasionally inciso-lobate with the lobes directed forwards. The stipites are densely hair-scaly. The veins, and consequently the sori, lie in a very oblique direction, so as to form an acute angle with the costa. The sori are small, crowded, and almost everywhere naked, a few fragments of indusium only being here and there produced; the two lines of spore-cases forming the twin sorus are, moreover, not unfrequently quite separated, even when mature. The upper surface has a finely striate appearance, the lines being oblique, in the direction of the veins. It was found near Minehead, Somersetshire, by Mr. W. Bowden, and is in the possession of Mr. Wollaston.

2. *detectum* (M.). This form grows about nine inches high, the fronds narrowish, coarsely crenate at the margin, truncately cordate at the base, and divided at the apex into a tuft of flat, spreading,

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many-pointed segments. The sori are small and naked, the indusia being either wanting, or represented by an indistinct narrow membrane, never, apparently, approaching a complete or perfect state. The fronds are very coriaceous, rendering the venation obscure. It was found in Guernsey, by Mr. James of Vauvert.

Striatum Series.

3. *striatum* (M.). A broadish sublanceolate permanent variety, somewhat indistinctly crenate and slightly undulate, but otherwise of normal outline. The fronds are obliquely streaked, or flaked with yellowish green on a dark green ground, which gives them a distinctly variegated appearance. It was found in Guernsey by Mr. James. Another form, with paler streaks, has been found in Guernsey by Mr. C. Jackson; a third, striped and mottled with straw-colour, has been met with also by Mr. Jackson, at Barnstaple, in Devonshire; and a fourth form, which is tolerably permanent, has been obtained by Mr. Wollaston, at Littlehampton, Sussex.

4. *fallax* (M.). A small growing form, with sinuate-interrupted or somewhat wavy fronds, which are more or less discoloured in streaks, the whole surface having a dull mealy appearance, though not really pulverulous, but roughish and lustreless. It was found at Ottery St. Mary, Devonshire, by Mr. Wollaston.

Sagittifolium Series.

5. *hemionitoides* (M.). This variety appears to have short subhastate fronds, which are of thickish texture; in the specimen before us, they are not quite five inches long, the sides curving to the point, the base being enlarged and cordate, with the lobes diverging and blunt-pointed, thus presenting an outline something like the less developed examples of the South European *Scolopendrium Hemionitis*. It was found near Nettlecombe, Somersetshire, by Mr. C. Elworthy.

6. *hastatum* (M.). This is a very elegant dwarf form, growing three to five inches high: we have seen two states slightly different. The best of these has the frond narrowish but rather broadest

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in the middle, the base developed into a pair of oblong acute divergent lobes, upwards of an inch long and three-eighths wide, the margin unequally crenate-lobate, and the apex multifid. Like the other crenate-lobate forms, this variety is supra-soriferous. It was found in Guernsey, by Mr. James. The other form is dwarfer, broadest below, less deeply crenate on the margin, and only slightly multifid at the apex. This was found at Hazlewood in the county of Sligo, Ireland, by the Rev. W. R. Bailey.

7. *sagittifolium* (Woll.). This variety is most remarkable for having the auricled portions at the base of the frond elongated, each with a distinct midrib, and directed downwards so as to resemble the barbs of an arrow. The fronds are of ordinary size, and in other respects nearly of the normal character; the margin is sometimes entire, somtimes crenate or with a few projecting lobes, sometimes slightly undulate, and in the case of the Sussex plant having a tendency to become dilated at the apices both of the frond and of the elongated auricles. A very fine form was found at Littlehampton, in Sussex, by Mr. Wollaston; and others have been obtained from Whitby by Mr. Clapham, and from Roche Abbey, Yorkshire, by Mr. S. Appleby; from Fremington, Devonshire, by Mr. C. Jackson; and from the counties of Clare and Kerry in Ireland, by Dr. Allchin. This is not the var. *sagittatum* of Willdenow, a dwarf South European plant, allied to *S. Hemionitis*.

8 *sagittato-crispum* (M.). This is a very handsome large-growing variety, the fronds reaching to more than a foot in length, and nearly or quite three inches in breadth. They are fertile, the sori extending sometimes to the basal lobes, much undulated, the margin being more or less distinctly crenate or crenately-lobed, and the base extended into a pair of elongated acute lobes, thus blending the characteristics of *crispum* (91) and *sagittifolium* (7). It has been gathered by Mr. Wollaston at Petersfield, in Hampshire, and also at Ottery St. Mary, Devonshire, and by Mr. C. Jackson at Barnstaple, Devonshire. In Mr. Wollaston's garden some very singular fronds, irregularly cleft and laciniate, totally unlike the usual crisped fronds, have been produced by the Ottery plant. Occasionally unilateral fronds, with the costa curved and cornute, and the lamina short and bireniform, accompanied by a separate reniform lobe, or by a pair of ovate-cordate

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stalked divisions like separate young fronds, have been produced by the plant gathered at Petersfield.*

9. *sagittato-laceratum* (M.). A very elegant form, with dwarfish much-frilled fronds, having arrow-shaped basal lobes, and a tendency to become multifid at the apex; the divisions of the frilled margins are extended into longish acute lobes; it thus unites the peculiarities of *crispum* (91), *sagittifolium* (7), and *laceratum* (145). It was found near Whitby in Yorkshire, by Mr. J. Willison.

10. *Monkmanii* (M.). This is a dwarfish form, the fronds being about eight inches high and nearly two inches wide. They are more or less sagittate or hastate at the base, broadest upwards, the margin having a few distant, projecting, pointed lobes, and the apex acute or occasionally divided. It was found at Castle Howard, near Malton, Yorkshire, by Mr. C. Monkman. Another form from the same place closely resembles it, but is somewhat crisped, and the base is rather cordate than hastate.

11. *sagittato-cristatum* (Claph.). This is a very handsome but rather variable form. The fronds are of moderate size, sagittate or hastate at the base, the enlarged lobes sometimes directed upwards, the margin somewhat wavy and irregular, or here and there bearing a few prominent lobes, or branched in the costa; the apex multifid and somewhat cristate. The veins are often united near the base. It has been found in some abundance by Mr. A. Clapham in Raincliff Wood, near Scarborough, Yorkshire.

* This irregular and abnormal condition of growth, which has appeared in many different species, Mr. Wollaston believes to be produced by the puncture of a little insect, respecting which he has favoured us with the following memoranda:—"It has long been my opinion that many of the abnormal forms seen among Ferns, and more particularly those of *Scolopendrium*, are caused by a small dipterous insect, which deposits its eggs in the cellular tissue between the cuticles of the frond. The puncture of, or rather the extraneous matter deposited by, the ovipositor, whilst the parts of the frond are in a young undeveloped state, arrests its natural development, producing a very perceptible knot-like thickening of the tissue, when the frond is held up to the light. It was, I believe, introduced into my Fernery on a diseased variety of *Polypodium Dryopteris*, found at Ambleside. Tobacco smoke has no effect on it, and it is the greatest plague, not even the Thrips excepted, to which Ferns are liable under artificial culture, completely destroying their natural characters of growth. I have only in one instance been able to detect an empty pupa-case attached to the frond." The insect, as we learn from Mr. Westwood, is *Sciara minima*, but he is doubtful as to its being the cause of the mischief.

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12. *sagittato-lobatum* (M.). This is somewhat like *sagittato-cristatum* (11), but the basal lobes are longer and more acute, directed downwards, and the apex is divided into a tuft of flat, acute segments, below which the frond is irregularly crenate-lobate. It was found at the Woodlands, near Whitby, Yorkshire, by Mr. W. Willison.

13 *Claphamii* (M.). This variety is of vigorous growth and very elegant. The fronds are a foot in length exclusive of the stipites, of moderate width—one and a half to two inches, with a pair of narrow acute spreading lobes at the base, the margin crisped, and somewhat irregularly crenated or sublaciniate, and the apex multifidly branched, in one example dividing into seven primary branches, some of which are again three-cleft and slightly curled. The fronds usually narrow somewhat near the base, and they are sometimes contracted below the multifid apex. It is a very handsome form, and was found by Mr. A. Clapham, at Grassington, Wharfedale, Yorkshire, in 1857.

14. *compositum* (M.). This is a singularly composite and very elegant form, remarkable from its uniting in itself the peculiar characteristics of *sagittifolium* (7), *crispum* (91), and *marginatum* (59). The fronds are about a foot long; they are sagittately-lobed at the base; the lower half is undulated or crisped, as is the extreme apex, while the upper portion is marginate, and laciniate toothed. It was received from Mr. Parker, nurseryman, of Holloway.

Cornutum Series.

15. *cornutum* (M.). This is a very beautiful, as well as curious variety. The fronds are usually dwarfish, though sometimes eight or ten inches long, coriaceous, somewhat undulate, irregularly crenate, or sometimes deeply lobed, the lobes obscurely toothed; they are cordate or sometimes truncate at the base, and usually abruptly rounded at the apex, the costa becoming excurrent about half an inch below the extremity, and projecting from the face of the frond, forming a long hook or horn, from which the variety takes its name. It is a fertile and thoroughly constant variety, invariably reproduced from its spores. Mr. Wollaston has a frond in which the horn has become developed into a lobed forked fertile frond,

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three inches long, and trumpet-shaped at the base. The plant originally known in gardens was found in Yorkshire by Mr. Thorne. Somewhat similar forms have been recently found in Somersetshire by Mr. C. Elworthy, and in Yorkshire by Messrs. Stansfield; it has also been recorded from Dunglass Dean, Dumbartonshire, by Dr. W. Nichol. [Plate LXXXIV B.]

16. *mucronatum* (Willd.). A very constant variety, raised by Mr. Clapham from spores of *polyschides* (21). The fronds are dwarf, the lamina from one to three inches in length, and scarcely an inch in breadth; they are subcordate at the base, of uniform width throughout, and bluntly rounded at the apex, the margin undulate and denticulate, and the costa excurrent, forming a horn projecting from the upper surface. It is a very interesting sterile form.

17. *subcornutum* (Tait). This handsome and distinct as well as constant variety is peculiar on account of its rigid coriaceous texture, and its upright habit. The fronds are six to eight inches high, rather narrow, crenate, or more or less deeply cleft into narrow rounded lobes; this small even toothing of the margin is sometimes remarkable. The fronds terminate abruptly in a rounded apex, and the costa occasionally becomes excurrent near the apex, and forms a horn or hook on the under side; they are also sometimes branched, either near the base, or towards the middle, or they are divided two or three times near the apex, each branch being blunt-ended; sometimes they branch several times on one side only. The sori are few and scattered. Mr. A. Tait of Edinburgh obtained this form under the name of *polyschides*, from the nursery of Mr. Sang, of Kirkaldy, Fifeshire. Mr. Clapham has raised some very interesting seedlings of this variety,* some of which are very ramose from about the middle of the frond, dividing and again dividing, so as to form in some fronds seven or eight divisions, which are of the usual crenate-toothed character, the horn being however wanting, and the fronds freely bulbiferous; they form dwarf elegant plants. Another seedling produces half of its fronds

* It would appear from these and other instances known, that new forms of Ferns, such as have been discovered of late years in such abundance in wild habitats, are from time to time being produced as seedling sports from the parent plant, and may some of them be destined to become perpetuated.

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strap-shaped and acute, in fact nearly normal, differing only in being slightly undulate and crenately-lobed, while the other half are shorter, ramose in the stipites, and multifid towards the apices of the branches. The plants seem to become more rigid, and to acquire the horn as they become more matured.

18. *perafero-cornutum* (M.). This is a curious little seedling, raised in 1857, by Mr. James of Vauvert. It is dwarf, scarcely three inches high including the stipites; the fronds cordate at the base, somewhat wavy on the margin, and rounded and retusely bilobed at the apex. At the base of the apical cleft the costa becomes excurrent in the form of a horn, and around the lower part of this, on the under side of the frond, is a frilled funnel-shaped cup, three-fourths of an inch in diameter.

19. *cornuto-abruptum* (M.). The fronds of this form are about six inches high and upwards of two inches broad; they are sub-undulated and rather irregular on the margin, abruptly rounded at top and somewhat lobed, the central portion with a crenate margin and bearing a horn as in *cornutum* (15). It is a constant form, and was found at Rivaulx Abbey, Yorkshire, by Mr. C. Monkman.

20. *marginato-cornutum* (M.). This is a dwarfish plant, the lamina of the frond measuring from three to six inches long. It is subtruncate at the base, narrowish, oblong, blunt and rounded at the apex, and cleft into numerous narrow lobes along the margin. The fronds have an excurrent soriferous membrane beneath, as in *marginatum* (59); and the costa is developed on the lower side into a long horn. It has been raised as a seedling by Mr. Wollaston, and is quite constant; a similar seedling has also been raised by Mr. Jackson of Barnstaple.

The varieties *sagittato-crispum* (8), *vivo-polyschides* (21), *interruptum* (30), *rugosum* (78), and *multiforme* (125), are also sometimes cornute.

Polyschides and Sinuatum Series.

21. *polyschides* (Ray). This variety, named in allusion to the numerous deep incisions on its margins, is sometimes met with in gardens under the name of *angustifolium*. The fronds are narrow, strap-shaped, from six inches to nearly a foot in length, and about

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three-fourths of an inch wide, slightly undulated, pinnatifid or deeply and irregularly crenate-lobed, with open sinuses between the lobes, which are more or less crenately-toothed; the base is subtruncate; and the sori, which are short oblong, or linear, are very irregularly disposed; the masses of spore-cases sometimes protrude between the clefts of the margin to the face of the frond. The venation is more or less disturbed, the veins frequently becoming united in an irregular manner. The plant is constant under cultivation, reproducing itself from its spores. Its early history is lost. The variety has been known since the time of Ray, and has been found occasionally in modern times. Sir J. W. Hooker has a specimen from Lismore (? Scottish); the late Mr. D. Cameron found it near Bristol; and others are recorded to have been met with at Fareham; at Edlington near Adwick, by Mr. J. Hardy; near Ilfracombe in Devonshire, by the Rev. J. M. Chanter; and by Mr. James in Guernsey. [Plate LXXXIII A].

Another form of this (*vivo-polyschides*, Claph; *fœcundum*, Sim.) is in the young state very proliferous. Mr. Clapham, by whom it was raised from spores of *polyschides*, states that he has counted sixteen bulbillæ on a single young plant. The fronds are narrow, irregularly sublobate and crenately toothed. Sometimes a dwarf cornute frond is produced, thus showing its relationship to *mucronatum* (16), which was raised from the same parent.

A third form, raised by Mr. Clapham, appears to be permanently of pigmy size; the fronds are from two to three inches high, including the stipites, undulate, sometimes furcate at the apex, truncate or cordate at the base, and irregularly contracted. This if permanent, may be called *polyschides pygmæum* (M.).

22. *macrosorum* (Fée). The fronds in this variety are narrowish, a foot or more in length, and upwards of an inch in breadth, the margin frilled or undulated as well as irregularly lobed, the lobes often deeply separated, but not having open sinuses, and bordered with a series of bluntish teeth; the base is truncate; the venation is sometimes disturbed, becoming here and there reticulate, and the sori are short, oblong, and irregularly disposed. This handsome form resembles *polyschides* (21), having the same kind of deep occasional incisions, but they are less manifest, being hidden by

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the undulation of the margin, and the marginal teeth are frequently deeper and more evident. This form is of continental origin, but a similar one, quite constant, and very ornamental in character, has been found in Guernsey by Mr. James of Vauvert.

23. *fissum* (M.). A vigorous and handsome form, somewhat resembling *polyschides* (21) and *macrosorum* (22). The fronds are, however, larger and broader, being from a foot to eighteen inches long, and from an inch and half to two inches wide, oblong, the base subcordate, the apex usually blunt, and the margin irregular, deeply incised, and somewhat undulate, so that the incisions are not very apparent, the whole being crenately toothed: the veins are slightly netted; and the sori grow in oval-oblong, irregularly-disposed masses. It is quite permanent, and was several years since found at St. Decuman's, near Nettlecombe in Somersetshire, by Sir W. C. Trevelyan, Bart. Similar forms have been gathered near Denbigh by Mr. J. W. Griffith; near Torquay and Dunchideock by Mr. R. J. Gray; and in Guernsey by Mr. C. Jackson.

24. *imperfectum* (Woll.). This variety was remarkable in the wild state for the unfinished appearance of the margin of the narrow frond, which appeared as though cut away as far in as the sori. The cultivated fronds become broader and lobed as in *polyschides* (21); they are eight or ten inches high, and an inch and three-quarters broad, truncate or subcordate at the base, abrupt and sometimes sub-cornute at the apex; the margin irregularly wavy, here and there obscurely crenate-lobed, or sometimes deeply lobed, as in *polyschides*, especially towards the top, the rest nearly entire. The sori are linear, unequal, many of them extending to the margin. It was found, in 1855, by Mr. G. B. Wollaston, on Whitbarrow in Westmorland, and a similar form has since been gathered at Barnstaple, Devonshire, by Mr. H. F. Dempster.

25. *fisso-lobatum* (M.). This is a very handsome form, resembling *fissum* (23) in its habit and in its broadish fronds, which are lobate on the margin, and split into numerous narrowish laciniæ, or teeth; but the apex, which is similarly toothed, is multifidly lobed. The fronds are contracted below the apex, irregularly reticulated, and freely fertile, as well as suprasoriferous. It was found near Nettlecombe, Somersetshire, by Mr. C. Elworthy.

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26. *reticulato-fissum* (M.). This is a fine form, resembling *fissum* (23) in general aspect, the frond growing a foot or more in length exclusive of the stipites, and measuring an inch and a half to two inches in breadth, lobed irregular undulated and laciniate-toothed at the margin, the apex obtuse, the base unequal and subtruncate. It is most remarkable for having the veins so much disarranged from the normal condition that near the costa they become confluent, often in thick bundles, forming irregular areoles throughout the whole length of the frond. It was found at St. Lawrence, in the Isle of Wight, by Mr. R. Bloxam.

27. *fissile* (M.). This is a distinct variety, with fronds nearly a foot long, and about an inch wide, unequal and subtruncate at the base, narrowed at the apex, the margin very deeply-lobed or subpinnatifid in an irregular manner, the larger lobes unequal, separated by open sinuses, and again divided into round-ended lesser lobes, or crenately-toothed. The sori are numerous and very irregular. The marginal lobes are more numerous but less crowded than in *fissum* (23), and *macrosorum* (22). It has been found near Nettlecombe, by Mr. C. Elworthy; and a closely similar form has been obtained at Mowthorpe Dale, Malton, Yorkshire, by Mr. C. Monkman.

28. *elegans* (M.). A neat and elegant plant, six to eight inches high, the fronds narrowish but irregular, sometimes with prominent lobes like arrested branches, but more usually wavy in outline, the margin crenately toothed, and minutely crisped in a very elegant manner; the base is subtruncate, and the apex bluntish. It seems to be sparingly fertile. It was found near Malton, Yorkshire, by Mr. C. Monkman.

29. *obtusidentatum* (M.). This is a pretty dwarfish variety, having the fronds variable in length, from six inches to a foot long, and about an inch and a quarter in width; the base is truncate, the apex usually blunt, the midrib not reaching the end; the margin sometimes lobed, the lobes separated by broad sinuses, sometimes scarcely lobed, but the whole margin is constantly notched with evident nearly uniform crenatures or blunt teeth. The sori occur in longish masses, and are irregularly placed. It was found near Ilfracombe, in 1855, by the Rev. J. M. Chanter. An elegant

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form rather undulated has been found by Mr. R. Bloxam, in the Isle of Wight. Mr. Clapham has sent a similar dwarf almost barren form, in which only a portion of the fronds are furnished with the marginal toothing; they are also somewhat cuneately decurrent at the base; this is from Wharfe, near Settle, Yorkshire. [Plate LXXXIV A.]

30. *interruptum* (Woll.). This is a beautiful and perfectly distinct variety, remarkable for the variations of form to which it is subject. The fronds are narrow but fleshy, the taller ones nearly a foot long, including the stipites, and about half an inch wide for the greater part of their length, the narrowed portion being sublobate and dentate; the base is subtruncate, and the apex normal, attenuate, about an inch wide, with a shiny somewhat rigid surface; in the lower narrowed or contracted part are interrupted portions varying from half an inch to an inch in length, in which the costa is quite bared. Some fronds, somewhat shorter than these, are entirely contracted, with the margins wavy, and the base very unequal. Others are reduced to four or five inches long, entirely contracted, with long bare portions of costa, which is in these parts quite terete and smooth, and bearing a long horn from the upper surface. Its chief peculiarity is the interrupted lamina; and it has some resemblance in form to the *laciniatum* forms of *sinuatum* (45), only it is much narrower and more fleshy. It was found in the county of Dublin by Dr. Kinahan.

31. *epiphylloides*. (M.). This is a curious form, its fronds resembling the truncated branches of some species of *epiphyllum*. The fronds are eight or nine inches high, the base subcordate, and the margin of the lower part irregularly lobate; two or three inches upwards the fronds become suddenly contracted, so that the lamina is reduced almost to the costa; it then swells out again forming another length, which is also truncately contracted at the upper end in the same way as the first, and tapers downwards in a wedge-shaped manner, the margin being more or less lobed; in the fronds before us there is a third terminal portion contracted at the base and broader upwards, the apex of which is obtusely rounded and sublobate. It is not fertile. This was found near Whitby, Yorkshire, by Mr. W. Willison.

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32. *irregulare* (M.). This is a sub-permanent form—one of those unaccountable freaks of nature which is seen at one time in its natural or normal growth, and at another assuming a most fantastic character; or the two conditions may be combined at one time in the same plant. The abnormal fronds which are eight or ten inches long, are divided nearly to the costa into a series of irregular lobes, which are again unequally incised or lobate, with variously shaped ultimate segments; the less deeply cut portions are crenately toothed; the margin is somewhat undulate, the costa is often branched or forked, and the whole development is altogether irregular. The veins are disarranged and reticulated. The abnormal fronds are sparingly fertile, the sori being very irregularly placed. This curious and elegant monstrosity was found in Guernsey by Mr. C. Jackson, who has also met with a similar form in Devonshire. Our figure represents but a small specimen, much less affected than others we have since received. [Plate LXXXIII C.]

33. *mutatum* (M.). An interesting form about a foot high, with narrow fronds, less than an inch wide, incised about half way to the costa, at nearly regular distances about half an inch apart, forming truncate square-tipped lobes. The sori are extended downwards from the base of the two sides of these divisions. A small portion near the apex on one side of the frond sent to us is normal. It was found near Nettlecombe, by Mr. Elworthy, who states that the plants bear some fronds which are normal in character, but narrow.

34. *prominens* (M.). A narrow fronded form, about a foot high, including the stipites. The fronds are truncate below, attenuate upwards to a narrowish blunt point, irregularly crenate and sublobate along the margins, but producing in the upper half a few irregularly disposed rounded narrowish lobes projecting about half an inch beyond the general line of the margin. It appears to bear a few long distant sori. It has been received from Mr. T. Pritchard, by whom it was found near Ruthin, in Denbighshire.

35. *inæquale* (Allchin). This handsome variety, which proves to be a constant and rare plant, has the fronds about six inches in length, exclusive of the stipites, and rather over an inch in width. The

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costa is ramose below or multifid near the apex; or sometimes a rounded lobe like an arrested branch protrudes from the margin. The base is truncate, and the apex usually divided, while the margin is deeply incised so as to form unequal lobes, which are evenly toothed, producing a fimbriate appearance; the margins both of the undivided portion and of the multifid apex are also slightly undulated or corrugate. The fructifications are copious but irregular. It was found in Ireland by Dr. Allchin, in 1853.

36. *furcans* (M.). A dwarfish form cordate at the base, and forked once or oftener at the apex, sometimes divided into a tuft of five or six lobes; the margin is unequally crenate-lobate. The veins are rather close and sometimes coalesce; and a few pale yellowish streaks appear on the surface. It is a fertile form, found by Mr. Elworthy in Somersetshire.

37. *limbospermum* (M.). A curious variety, with thick coriaceous fronds eight or ten inches long, upwards of an inch wide near the base, narrowing upwards and becoming forked at the point, or a little below, with the branches forked at their tips. The base is subtruncate, and the margins are somewhat irregular with projecting lobes, which often point forwards so as to take the form of coarse serratures, the whole being obscurely toothed. The fructification is peculiar; the sori are very short and close to the margin, in many places dot-like and attached to the extreme edge, the dots sometimes confluent so as to bring the spore-cases into a narrow irregular marginal line; some sori are also produced on the upper surface. It was found near Nettlecombe by Mr. Elworthy, who describes all the fronds to be alike as regards the fructification.

38. *curtum* (M.). This form has thick fronds with confused or muddy-looking tissue as in *turgidum* (72); they are variable in form, sometimes nearly normal, with the apex dentate, sometimes contracted and truncate at the base, more or less lobed at the margin, abrupt lobate or abruptly ramose, often abbreviated at the apex, here and there subcontracted and supralineate. It was found in Somersetshire by Mr. Elworthy.

39. *inops* (M.). This variety bears elegant narrowish fronds six or eight inches long, cordate at the base, irregular, somewhat lobed, and throughout crenate-dentate at the margin, the apex forked; or

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sometimes the fronds are forked below and the branches are again divided. It was found in Guernsey by Mr. James, and is of rather variable character.

40. *subvariegatum* (Woll.). The fronds of this form are faintly streaked or flecked with dull straw-colour, which gives them a mealy or subvariegated appearance; the pale colour being apparently owing to some disorganisation of the tissue. The fronds are six inches to a foot long, extremely various in shape: ramose, or multifid, or both, indeed they are almost always divided at the point; irregular, sub-lobate, undulated, crenate, or here and there laciniate, generally cordate at the base, sometimes however, as in *sagittifolium* (7), producing an acute auricle. They are profusely fertile, and they are also prone to send out a midsummer shoot, to which all Ferns are liable in a slight degree; this, however, has been observed to produce a stipitate frond from the apex of the larger one, the stipes of the second frond being thickly clothed with scales as in the first. It was found by Mr. Wollaston at Glanville's Wootton, in Dorsetshire. [Plate LXXXVI B.]

41. *rimosum* (M.). A large growing vigorous very handsome permanent form, the fronds of which grow from a foot to eighteen inches in length, and vary from one to two inches in breadth; the base is cordate; the margin subundulate, sublobate, and crenate, becoming deeply inciso-crenate towards the apex, which is often once or twice divided in a lobate manner. The fronds are sometimes more deeply inciso-lobate nearly throughout. From the margin inwards, especially in the crenated parts, the upper surface is sulcate, with here and there a thickened prominent point, so that the surface is uneven as in *scabrum* (81). The plant, which is abundantly fertile, was found in Guernsey by Mr. James. Mr. Wollaston has raised the same variety from spores of a fine form of *submarginatum* (74) obtained at Glanville's Wootton, in Dorsetshire.

42. *lanceolum* (M.). A dwarf form with lance-shaped fronds, narrowed and cordate at the base, attenuate at the apex, the margin coarsely crenate and wavy. It was found in the island of Guernsey by Mr. James.

43. *crenato-lobatum* (M.). A vigorous and elegant form, normal in size and general outline, but the margin, especially in the upper

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half, is strongly crenato-lobate, and sometimes a little undulated; the base is cordate, the apex usually attenuate and simple, but some forms similar in other respects are lobed or multifid at the apex. The fronds are very distinctly suprasoriferous, the upper series of sori being often as large and distinct as those of the lower surface. It is of rather frequent occurrence, having been found at Ilfracombe, Devonshire, by the Rev. J. M. Chanter; at Barnstaple, by Mr. C. Jackson, the plants being freely soriferous above and scarcely at all beneath; at Saltwood, Kent, by Mr. F. Brent; at White Waltham, Berkshire, by Mr. D. Maher; at Castle Howard, Yorkshire, by Messrs. Stansfield; at Coxwold, by Mr. C. Monkman, and again at Mowthorpe Dale with ramose stipites; at Whitby, also in Yorkshire, by Mr. J. Willison (multifid form); and in Guernsey by Mr. Jackson (one form multifid) and Mr. James. The fronds are sometimes slightly marginate, and merge into those of *submarginatum* (74). The plant formerly called *stenophyllum*, found by Mr. James, in Guernsey, a narrow linear form, cordate at the base, with broad shallow entire crenatures extending nearly to the point, and having numerous small roundish sori near the margin above, as well as the normal ones beneath, does not appear to be permanently distinct. Most of the forms are ornamental plants, and all are extremely interesting on account of their suprasoriferous habit. [Plate LXXXV B.]

44. *pocilliferum* (M.). A large irregularly-lobed permanent form, stout and rigid in texture, often forked, somewhat supra-marginate, and sometimes contracted or irregularly lobed or sublaciniate at the margin; its chief peculiarity, however, is the production on its under surface, of irregularly-placed cup-shaped or trumpet-shaped excrescences, frequently a quarter of an inch in length. It was found in Guernsey by Mr. J. James, of Vauvert. A variety with similar excrescences having the fronds sinuate-lobed, and the venation much disturbed, has been found at Crambe near Malton, by Mr. C. Monkman. The fronds of this plant are also sometimes laciniate, lobed, or irregular, or slightly submarginate.

45. *sinuatum* (Woll.). This name includes numerous large-growing irregular and usually handsome forms. Some of these have the margin of the frond sinuated, the lobe-like projections being irregular in size, and entire or obscurely crenate. Sometimes

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irregular portions of the frond are contracted, these portions having the short distinct teeth or the shallow lobes of the *polyschides* type, while here and there other portions grow out to the normal width, and either form rounded or oblong projecting lobes, or entire normal spaces of greater length: these have been called *laciniatum*, but they insensibly merge into *sinuatum*. The contracted parts are sometimes elegantly crisped, as in some plants from Settle, found by Mr. Clapham. Sometimes the apex, or the base, or one side only, of the frond is affected. The base is usually imperfectly developed, being more or less irregularly truncate; and the apex is usually attenuated, but sometimes multifid. Scarcely two fronds are alike, but the fronds are always more or less affected. The venation is slightly confused in the contracted parts: but the sori are normal. This form has been found in—Devonshire: Ilfracombe, *Rev. J. M. Chanter*. Somersetshire: Nettlecombe, *C. Elworthy*. Sussex: Littlehampton, *G. B. Wollaston*. Yorkshire: Ashdale near Helmsley, *A. Clapham;* Moughton near Settle, *A. C.;* Kirkham Abbey, *C. Monkman;* Oldstead, *C. M.;* Malton, *C. M.* Westmoreland: Whitbarrow, *G. B. Wollaston*. Denbighshire: Ruthin, *T. Pritchard*. Guernsey, *J. James, C. Jackson*.

46. *sinuato-lobatum* (M.). A bold form with broad fronds, lobed or sinuated, and more or less irregular in width and outline, the apex twice dichotomously forked, with broad slightly crispy divisions; the base is cordate. It was found in Somersetshire by Mr. Elworthy.

47. *vespiforme* (Claph.). This is a singular plant, and tolerably constant. The fronds are of normal size, cordate at the base, attenuate at the apex, and tolerably regular and entire on the margin, except about the centre where there is a narrowed portion contracted almost to the costa. It was gathered at Fountains Abbey, Yorkshire, by Mr. Clapham.

48. *curiosum* (Woll.). This form has a general resemblance to *sinuatum* (45) in a portion of its fronds, which are partially lobate and sub-contracted, and partly normal on the margin. Sometimes for a considerable portion of its length the lamina is narrowed but entire; the base is usually much narrowed and then truncate, and the veins are much reticulated in the contracted parts; the apex is simple or

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lobate. Sometimes the fronds are nearly normal in outline, cordate at the base and deeply crenated in an irregular manner along the margins; or occasionally slightly undulated. The upper surface is marked here and there with distant streaks of yellowish-green. It was found by Mr. W. W. Reeves, near Worthing in Sussex.

49. *salebrosum* (M.). An elegant form allied to *sinuatum* (45) but having shorter fronds, which are sometimes subtruncate, sometimes cordate at the base, attenuate at the apex, the margin not contracted but furnished with unequal rounded lobes projecting beyond the general outline, the whole including the lobes being crenately toothed. It was found in Guernsey by Mr. James. A large form having something of the same character found by Mr. Elworthy, has been called *obtusilobatum*.

50. *projectum* (M.). A large and singular form, of normal size, the base cordate, or subsagittate, the margin plane or subundulated and furnished with distinct broadish acute lobes half an inch long or more projecting therefrom; the apex is attenuate. The best form we have seen, subundulate and with more numerous lobes, and subsagittate at the base, was found at Ilfracombe by Mr. J. Dodds; and others have been sent by Mr. Elworthy from Nettlecombe; by Mr. J. Crossfield from Kendal; by Mr. Sclater from Newick; by Mr. Bloxam from Tenby; and by Mr. Stansfield from Scarborough.

51. *resectum* (M.). This is a fine variety, of normal size, remarkable from the absence of the usual auriculate lobes at the base of the frond, which are truncate, and somewhat rounded off, thus producing a kind of lance-shaped outline. The margin is slightly but prettily undulated and sinuately lobed, and the lobes are crenately toothed. The plants have a tendency to merge into *sinuatum* (45). It was found at Littlehampton, Sussex, by Mr. Wollaston.

52. *retinervium* (M.). The fronds of this variety are about nine inches high, dissimilar, uneven in outline, subcordate or subtruncate at the base, sometimes multifid at the apex, the margin slightly or deeply lobed, sometimes in a sinuous manner and here and there contracted, the more normal parts obscurely crenated. The contracted and lobate portions are marginate. The fronds are blotched with pale green, almost amounting to variegation. The veins are much netted even in the more normal shaped fronds and parts;

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this netted venation being the chief peculiarity of the variety. It was found in Ireland in 1853 by Dr. Allchin, and is unique.

53. *viviparum* (Woll.). This plant is of pigmy size. The fronds are from one to four inches high including the stipites, and from half an inch to an inch and a half wide, altogether irregular in shape, but very conspicuously laciniate on the margin, and freely producing bulbillæ both on the fronds and stipites: indeed this variety affords one of the most remarkable instances of viviparous growth known amongst British Ferns. The fronds are sometimes more regular in form, but are then equally dwarf, and are also undulated and sinuate-lobate on the margins. The variety was found in 1853 by Dr. Allchin in the county of Clare, Ireland, and is perfectly constant.

54. *opacum* (M.). A curious depauperated looking form, remarkable for its thick opaque and dull looking fronds, which are from three to six inches high, and narrow, but variable in width; they are cordate, sometimes unequal at the base, attenuate at the apex, irregular or sinuous and crenate or sublobate along the margin, sometimes contracted. It was found in Guernsey by Mr. Jackson.

55. *bullatum* (M.). A dwarf plant about six inches high. The fronds are an inch broad, the base truncate, and slightly supralineate, the margin somewhat irregular, crenately or subsinuately lobate, the apex attenuated bluntish or forked; they are sparingly fertile beneath, and bullate or blistered above, the tissue having a confused opaque appearance. The veins are irregular, sometimes netted. It was found at Littlehampton by Mr. Wollaston.

This series might also include the following varieties, which are placed in other groups with which they accord in certain peculiarities: *hastatum* (6), *marginato-fissum* (61), *marginato-irregulare* (62), *coriaceum* (71), *turgidum* (72), *turgido-irregulare* (73), *crenato-crispum* (99), and *undulato-projectum* (102).

Marginatum Series.

56. *supralineatum* (M.). The marginate group of varieties may be known by having an excurrent membrane developed from the surface of the frond. In *supralineatum* the membrane is confined to the face or upper surface. There are several forms known, some having but a small portion of each frond, others having one side

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only, and others one or more fronds on a plant, affected; but the most marked have the whole plant affected more or less, and when perfect these are very handsome objects. The fronds are from six inches to a foot long, and from one to two inches broad; the base truncate or cordate, the apex obtuse or acute or sublobate, and the margins exterior to the membrane-like line irregularly lobed or laciniate-toothed, sometimes undulated. The excurrent membrane forms a slightly sinuous line on each side of the rachis, reaching in the well-marked fronds from the base to the apex, and sometimes so distinctly-marked as to produce the appearance of a narrow frond of normal form superimposed on an undulated or laciniated variety. The plant first observed, was received from Epernay by Mr. S. F. Gray, but various English forms have since been obtained in—Yorkshire: Settle, *A. Clapham.* Cornwall: Penryn, *G. Dawson.* Devonshire: Ilfracombe, *Rev. J. M. Chanter;* Torquay, and Dunchideock, *R. J. Gray.* Somerset: Nettlecombe, *C. Elworthy.* Sussex: *Rev. W. H. Hawker.* Hampshire: Petersfield, *G. B. Wollaston.* Isle of Wight, *R. Bloxam.* Surrey, *Dr. Allchin.* Guernsey, *C. Jackson, J. James* (very fine). A beautiful form with the fronds sublobate undulate and dentate at the margins, and having the membranous line strongly developed, and in many cases placed near the costa, as in the Epernay form above mentioned, has been raised from spores by Mr. Clapham. [Plate LXXXVII A.]

57. *supralineato-resectum* (M.). The fronds of this elegant and permanent form are lanceolate, being tapered off in a curving line to the base, and attenuate at the apex; they are from six to eight inches long, and an inch or an inch and a half wide in the broadest part; the margin is crenately toothed. The fronds are distinctly supralineate, and fertile. It was found in Guernsey by Mr. James.

58. *supralineato-lobatum* (M.). An elegant form growing about eight inches high, with the fronds subcordate at the base, and but slightly supralineate, crenate-lobate on the margin, and lobate or multifid at the apex. This has been found at Nettlecombe by Mr. Elworthy. A still more beautiful form, having the supralineate character more strongly marked, especially in the upper or lobate portion, has been found in the Isle of Wight by Mr. R. Bloxam.

59. *marginatum* (M.). This remarkable form, though but recently

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described, must have been long known, as a garden specimen received from the younger Linnæus is preserved in the Smithian Herbarium. In the most characteristic plants the fronds are erect, a foot or more in height, and about an inch in breadth; the base subtruncate, and the apex attenuated, the margin irregularly lobed, and dentate. On the under surface is borne within the margin an excurrent membrane, which is also lobed; the fronds have therefore, as it were, a double margin, and both surfaces of this membrane, and the under surface of the frond itself exterior to it, are soriferous, in the more vigorous state, while in a less perfectly developed condition the membrane is reduced to a longitudinal vein-like ridge. This was found at Nettlecombe, by Mr. C. Elworthy. Other forms of the variety have since been found in many localities:—Somersetshire: near Selworthy, *Mrs. Archer Thompson*; Minehead, *W. Bowden*. Devonshire: Ilfracombe, *Rev. J. M. Chanter* (several forms); Combe Martin, *Rev. J. M. Chanter*. Cornwall: Enys Penryn, *G. Dawson*. Sussex: Littlehampton, *G. B. Wollaston*. Isle of Wight, *R. Bloxam*. Gloucestershire: Stroud, *W. M. Cooper*. Yorkshire: Grassington, Wharfedale, *A. Clapham*. Guernsey, *J. James* (fine). [Plate LXXXVI A.]

There is in the possession of Mr. Wollaston, a form of this variety, with multifid apices, purchased of Potter, a well-known dealer, since dead, the history of which cannot be traced; and from this, which is a tall growing form, the pigmy variety *proliferum* (68) has been raised, as well as plants exactly resembling itself.

60. *marginato-fimbriatum* (M.). This is a narrow form, with the base subcordate, and the margin of the frond fringed with small prominent and tolerably regular teeth. This form, found in North Lancashire, near Cartmel, by Hillman a collector, has been sent by Mr. F. Clowes; and a similar one from Silverdale, Yorkshire, by Messrs. Stansfield.

61. *marginato-fissum* (M.). This form of *marginatum* (59) has a broad cordate base, and an acute or attenuated apex, the margin deeply cleft into narrow obtuse lobes. It is a Devonshire variety, and has been sent from Barnstaple by Mr. C. Jackson; and from Ilfracombe by Mr. J. Dodds.

62. *marginato-irregulare* (M.). The fronds of this dwarfish

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slender elegant form resemble *irregulare* (32) in outline, being sinuately-lobed, or irregularly contracted or laciniate; they are also marginate almost close to the edge, and in most parts dentate; the base is truncate or subcordate, the apex attenuate or bifid. It was found at Oldstead in Yorkshire by Mr. C. Monkman.

63. *marginato-lobatum* (M.). A very handsome variety growing from nine to twelve inches or upwards in height, the fronds about an inch wide, laciniate toothed along the margins, and dividing in a multifid manner at the apex into several (5-6) lobes, which are toothed like the frond and narrow off to a point. It has been raised from spores both by Mr. Elworthy and Mr. Wollaston. A dwarf form resembling this, with narrow marginate fronds forking above the middle, each branch divided at the apex into a tuft of dilated scarcely crispy segments, has been sent by Mr. C. Jackson.

64. *marginato-cristatum* (M.). A beautiful variety raised by Mr. Clapham from spores of *submarginato-multifidum* (76). The best form of this has fronds six to eight inches long exclusive of the stipites, and of the usual marginate character in the lower part, while the apex is divided into a large flabellate crispy tuft of laciniate segments three or four inches in breadth. In a second form, the fronds are more irregular and unequally marginate below, much narrowed upwards, and dividing into an irregular often one-sided tuft of segments. A third form (all these raised at one time) is smaller, narrower, with a less branched apical tuft, and more resembling *marginato-lobatum* (63).

65. *marginatum tenue* (M.). A very interesting dwarf form three to six inches high, the fronds from one-fourth to half an inch wide, distinctly marginate, and laciniate dentate, sometimes irregularly so at the margins, occasionally cornute, or with the apex dilated, sometimes proliferous. It has been raised by Mr. S. Appleby of Doncaster,* and by Mr. W. Nixon.

66. *vivo-marginatum* (Claph.). An odd-looking dwarf variety raised from *submarginato-multifidum* (76). The fronds are two to

* Mr. Appleby states that his seedlings were raised from a narrow elegant form of *submarginatum*. Among the seedlings a considerable number, upwards of forty, were found to be dwarf, slender, and very prominently marginate; these are supposed to have originated from the spores immediately developed on the marginate

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four inches long, very narrow, sometimes not more than one-eighth, sometimes nearly a quarter of an inch wide, the margin entire, or with a few distant slender teeth or sometimes slightly lobed, marginate when there is breadth for the development of the membrane, multifid at the apex, the segments toothed like the rest of the frond. Sometimes fronds are produced which seem to consist of a scarcely margined costa, the multifid apex being represented by a tuft of fine teeth-like segments. It differs from *proliferum* (68) in being multifid. [Plate XC *bis*, B.]

67. *ramo-proliferum* (Claph.). This form, raised along with *vivo-marginatum* (66), is equally odd-looking, the parts being reduced to a quarter of an inch or less in width. One of the best fronds, represented in our figure, is ramose below into three branches, each about three inches long; these divide about the middle into two divisions, which again divide, and the apices of these ultimate divisions are split down according to their width into two three or more narrow segments; the margin throughout, except in the ultimate segments, is coarsely serrated, and the fronds are all marginate, and have very irregular venation. The fronds are sometimes single, and are then represented by one of the branches above described. Some fronds are eight inches long, forked near the base, the two branches five inches long, and not broader than the stipites, and then forking two or three times into a small tuft of slightly broader segments, which bear two or three small crenate lobes, and are soriferous. Some fronds, equally long, are only divided at the very tips into a few short thick divaricate soriferous lobes; and others resembling these are merely horned at the top of the stipitate portion. This variety and the last are most remarkable productions. Mr. Jackson has sent fronds of some seedlings three years old, which are about an inch and a half high, twice forked, with narrow branches, evidently of the same character as the form first described above. [Plate XC *bis*, A.]

68. *proliferum* (Woll.). This curious little monstrosity was obtained from spores of a multifid form of *marginatum* (59). The plants are of pigmy dimensions, seldom exceeding three inches in

membrane of the parent frond. Mr. Appleby thinks, that as they become more developed some of them will prove to be strikingly dissimilar. It is remarkable that the seedlings of different forms of *submarginatum* should be so peculiarly sportive.

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length; and commonly with the lamina barely exceeding an inch long, and from three to five-eighths wide. The fronds in general outline are mostly oblong and obtuse or truncate, sometimes calyciform or cornute, deeply and irregularly marginate, the excurrent membrane being so much developed as to produce the appearance of the frond being split in two edgewise on each side the costa. The upper surface is irregularly verrucose. The fronds do not produce fructification, but in lieu thereof, curious little bulbils appear on their surface, and these ultimately form minute plants exactly like the parent. The fronds sometimes consist wholly of the stipes and costa, the latter being tapered off and pointed like an awl, and no leafy or herbaceous portion being produced. This curious variety was raised several years since by Mr. Wollaston.

69. *fimbriatum* (Allchin). This unique variety bears two sorts of fronds, besides the abortive ones consisting of hooks and points peculiar to this group. The broader ones are three-quarters of an inch wide, and six to nine inches in length, narrowed and truncate at the base, often with small separate lobes; the margins irregularly frilled, crenate-lobate with the lobes crenate, and somewhat undulated; the sori are mostly exterior to the excurrent membrane, which is the same as in other marginate forms and very distinctly developed. The other kind of frond is long and very narrow, being about a quarter of an inch wide, and from nine inches to a foot in length, more nearly resembling a winged rachis than a frond, the leafy part on either side being of about the same width as the rachis itself; its margins are frilled as in the other form, but more minutely divided, and the disrupted membrane recedes even to the rachis itself. It is a very neat and curious plant, and was found some years since, in Guernsey, by Dr. Allchin.

70. *constrictum* (M.). A curious form, formerly described under this name, having medium-sized fronds in which the upper half was broad and almost normal, and the lower half, except the extreme base where the usual cordate lobes were developed, was contracted to less than half the width, deeply crenated and marginate, has not proved constant. It was found by Mr. James in Guernsey. Another form to which the name may be transferred, also found in the same island by Mr. James, is permanent. This has fronds about six inches

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long excluding the stipites, and is normally cordate at the base so as to form a pair of enlarged lobes there, then contracted, becoming less so upwards but having rounded projecting lobes, the contracted parts laciniate. It resembles the laciniated forms of *sinuatum* (45), but is marginate where contracted, and forms an elegant variety.

71. *coriaceum* (James). A dwarf form remarkable when fresh for its coriaceous texture. The fronds are irregularly inciso-dentate, and somewhat lobate, slightly marginate, with the margin toothed; the base is cordate, and the apex generally abrupt; they are sparingly and irregularly soriferous, the sori being borne on the under or upper surface, or on the actual edge of the frond. It was found in Guernsey by Mr. James.

72. *turgidum* (Woll.). This variety has been named in allusion to the thick or muddy-looking appearance of the cellular tissue between the veins. The fronds are coriaceous or fleshy, from six to ten or twelve inches long, one and a half to two inches broad, the margin irregularly lobate or crenate-lobate, sometimes very irregular, crenate-dentate, or laciniate-toothed, more or less evidently marginate, the margination often close to the edge producing a membranous appearance there; the base is cordate and the apex not unfrequently forked or multifid, sometimes abrupt or sometimes very irregular; the venation is irregular and occasionally reticulate. It is fertile, and quite permanent under cultivation; and has been found in—Sussex: Week, *G. B. Wollaston.* Somersetshire: Nettlecombe, *C. Elworthy.* Devonshire: Barnstaple, *C. Jackson;* Ilfracombe, *J. Dodds.* Yorkshire: Castle Howard, *C. Monkman;* Oldstead, *C. M.;* Hackness, Scarborough, *A. Clapham;* Knaresborough, *A. C.;* Whitby, *W. Willison.* Lancashire: Todmorden, *A. Stansfield.* Westmoreland: Whitbarrow, *F. Clowes.* Guernsey, *J. James.*

73. *turgido-irregulare* (M.). This resembles *turgidum* (72), but is more irregular in outline, and more deeply and distinctly lobed, and slightly submarginate. Specimens having these peculiarities have been sent from Whitby by Mr. W. Willison; and from Nettlecombe by Mr. Elworthy.

74. *submarginatum* (Woll.). This includes several subvarieties, not having sufficiently distinctive characters to be kept separate, the chief connecting peculiarity being that the fronds are only here and

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there marginate or furnished with the excurrent membrane characteristic of the marginate group, and hence they are called submarginate. The fronds are mostly of normal size, and vary from one to two inches in breadth, the base being usually cordate but sometimes narrowed and subtruncate, and the apex attenuate or lobate, sometimes furcate, or multifid; the margins crenate-lobate, especially towards the apex, the lobes often crenately-toothed. These fronds are freely soriferous beneath in the usual way, and they are also suprasoriferous, in which respect, and in consequence of their crenate-lobate margins, they approach *crenato-lobatum* (43). Other fronds are sometimes produced similar to the perfect ones on one side of the rachis, and on the other here and there narrowed and dentate or laciniate; others are truncate, submarginate, and obliquely cornute; and others again are sometimes borne, which are abortive, having nothing but a short scaly stipes without any of the lamina developed. The plants are usually of elegant character, and not very uncommon, having been found in—Devonshire: Ilfracombe, *Rev. J. M. Chanter.* Sussex: Littlehampton, *G. B. Wollaston* (lobate form); Hastings, *S. F. Gray.* Isle of Wight, *R. Bloxam.* Dorsetshire: Glanville's Wootton, *G. B. Wollaston.* Pembrokeshire: Castle Malgwyn, *W. Hutchison.* Glamorganshire: Southerndown, *T. H. Thomas* (scalpturate). Yorkshire: Castle Howard, *C. Monkman;* Rivaulx Abbey, *C. M.;* Coxwold, *C. M.;* Mowthorpe Dale, *C. M.* (lobate); Doncaster, *S. Appleby;* Settle, *A. Clapham* (irregular); Malham, *A. Stansfield;* Mulgrave Castle, *A. S.* Nottinghamshire: Worksop, *S. Appleby.* Durham: Sunderland, *J. Fairbridge* (lobate). Guernsey, *C. Jackson* (lobate), *J. James.* Ireland, *Dr. Allchin.*

75. *submarginato-dentatum* (M.). A dwarf and interesting form raised from spores by Messrs. Stansfield of Todmorden. The fronds are variable, three to six inches long in the example before us, an inch to an inch and a-half wide, cordate at the base, the margin sinuous and crenately-toothed throughout; the longer frond is narrowed but abrupt at the apex, the shorter one divides into two branches about a couple of inches long, rounded at the ends, and diverging right and left at a right angle with the lower portion. It is said to be constant, and is curious and elegant.

76. *submarginato-multifidum* (M.). This is a very fine form, mar-

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ginate almost continuously, through the greater part of the frond, but near the margin and irregular. The fronds are upwards of a foot long, about an inch or rather more in width, cordate at the base, irregularly lobate and sinuous along the margins, and multifid with a tuft of numerous small dilated segments at the apex; in the fertile portions the margin is also laciniate-toothed. It was found at Hackness near Scarborough by Mr. A. Clapham.

Besides being itself of ornamental character, this variety is remarkable as having been the direct parent of the following marvellously distinct forms raised by Mr. Clapham from its spores :— *marginato-cristatum* (64), *vivo-marginatum* (66), *ramo-proliferum* (67), *proliferum* (68), *ramo-submarginatum* (153), and *ramo-marginatum* (154). These seedling plants were very carefully reared, and Mr. Clapham informs us, that 58 of them, retained in his own collection, yielded the following results :—

S. proliferum	6 plants	A fair proportion of these plants were proliferous; and where fertile, also suprasoriferous.
S. vivo-marginatum	26 ,,	
S. ramo-proliferum, two forms		
S. marginato-cristatum, three forms	5 ,,	
S. ramo-marginatum, two forms	5 ,,	
S. ramo-submarginatum	16 ,,	

77. *peraferum* (Woll.). This variety is interesting chiefly on account of a curious pouch or pocket produced at the blunt apex of the frond. There are two plants having this peculiarity, a taller and a dwarfer one; the latter having fronds about six inches and the former about a foot long. The fronds are nearly or quite two inches broad, cordate at the base, somewhat undulated, here and there lobed or laciniate-toothed and at these parts submarginate; the apex is obtusely-rounded, somewhat lobate, the costa not reaching to the margin, but becoming developed in a leafy or marginate manner into a small pouch, this pouch like the membrane in *marginatum* being sometimes fertile. The costa is sometimes prolonged in the form of a horn through the marginate apical membrane which forms the pouch. It was found in Ireland by Dr. Allchin, and though occasionally bearing normal fronds, is a very fairly constant variety of curious rather than elegant aspect.

78. *rugosum* (Allchin). A curious and distinct variety, with a remarkable smooth appearance. The stipes is often long (3-9 inches),

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and is so thinly clothed with scales as to appear naked; whilst the leafy portion or lamina is comparatively short, being sometimes not more than an inch, rarely exceeding three or four inches long; the base is cordate, the apex obtuse, the margin more or less undulated lobed or contracted, and laciniately or crenately toothed. The fronds are more or less but irregularly marginate, most so towards the apex, where, at the termination of the costa, there is frequently formed by the epidermal development, an irregular pouch or pocket, as in *peraferum* (77). The costa on the upper surface is raised, and broken up into little irregular excurrent points, producing a muricate, or almost echinate ridge; and on the under side it frequently becomes excurrent in the form of a horn. The fronds are fertile in the upper portion, and the pouch is also fertile. This was found in Ireland by Dr. Allchin, and is a permanent interesting and unusual form.

79. *nudicaule* (Allchin). The fronds of this exceedingly rare form are variable, being narrowish, cordate at the base, simple or multifid at the apex, short or elongate, some of them pocketed, some marginate. The chief peculiarity of this variety, however, consists in the almost total absence of scales, a condition very unusual in this genus, but here so strongly marked, that in the vernation of the plants, the convolutions of the fronds which are to be developed for several years onwards are visible on the crown. The plants resemble *rugosum* (78) in their peculiar smooth appearance, but otherwise are quite distinct. It was found by Dr. Allchin in Ireland.

80. *siciforme* (Woll.). This is the most slightly marginate of the varieties referred to the *marginatum* group, and is not always constant. The fronds are narrowish, less than a foot in length, and about an inch wide, subcordate at the base, lance-shaped, having somewhat flexuous or laterally waved margins which are slightly crenate, and obsoletely, though continuously, marginate beneath; the apex being bluntish; they are also supra-soriferous, but the upper sori are very small. It was found in Guernsey by Mr. C. Jackson.

81. *scabrum* (Woll.). This is a very handsome variety, somewhat intermediate between the *marginatum* and *muricatum* groups. The whole plant is of vigorous growth, with fronds upwards of two feet in length, and nearly two inches broad; the base cordate or truncate

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and sublaciniate, the apex attenuate; the margin irregularly crenate-lobate, somewhat undulated. They are submarginate beneath, and submuricate towards the margin above, the face of the frond being uneven, hollowed out here and there into cavities, bounded by raised lines and points, so as to become almost interruptedly supralineate. The fronds are less affected in the lower half, being there only slightly crenate; they are abundantly fertile, and somewhat suprasoriferous. It was found in Ireland, in 1853, by Dr. Allchin, and is a singular and rare as well as handsome variety.

82. *bimarginatum* (Woll.). This is one of the most curious varieties yet known, and forms a very handsome plant. The fronds are sometimes narrow, from about a quarter to half an inch wide, and about six inches long excluding the scaly stipes; others are three-quarters of an inch wide, and from six to nine inches long. The base of the fronds is truncate, often broken up into a few separate lobes; the apex is either simple or multifid; the edges are laciniate-toothed or broken up into narrow shallow truncate lobes, which are bifid or toothed; and the surface both above and below is marginate, the fronds thus becoming bimarginate. The excurrent membrane forming the margination, appears on the under side, as in other marginate forms; but on the upper surface, the cuticle is very irregularly broken up, the membranes being gathered and puckered so as to form cavities and excrescences, while the few lower separate lobes not unfrequently spread into small calyciform or trumpet-shaped bodies tapered to a stalk-like base. The tip of the frond whether simple or divided, is generally somewhat less obviously marginate, and sometimes a little broader. The autumnal fronds are broader and irregular on the margin. It seems a somewhat tender variety, and does not perfect its spores so freely as many other kinds. The original plant was found near Rotherham, in Yorkshire, by Mr. H. Hayling, gardener to the Rev. W. Hudson, of St. Catherine's, Regent's-park; and this form is not unfrequently multifid. Others having the same general characters have been found by Mr. J. R. Cobb, on a bridge near Brecon; and by Mr. Hadwin at Ulverstone: the latter being a finely multifid-lobate plant, apparently constant. Mr. Elworthy has raised the same form from spores.

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83. *bimarginato-muricatum* (M.). A singular and exceedingly beautiful form, combining the characters of *bimarginatum* (82) and *muricatum* (85). The fronds are a foot long, of two kinds; the narrower and more decidedly bimarginate ones are irregular in outline like the forms of *sinuatum*, that is, there are here and there larger projecting lobes or portions of frond, the rest being contracted to about half an inch in width. In the example before us there is one cordate basal lobe, and the extreme apex is nearly normal, but the rest is nearly all contracted and bimarginate; the lobes of the margin are in several places carried quite down to the excurrent membrane, which is very near the costa, and being set some distance apart, the frond has an interrupted character; these separate lobes form little marginal cup-like cavities. When the surface is broader, it is striately furrowed as in *muricatum* (85); the contracted parts being, however, like *bimarginatum*. The broader fronds are about an inch wide, cordate below, the margin unequally lobed and irregular, and the surface striately-furrowed. It was found in Guernsey, by Mr. James.

84. *bimarginato-cordatum* (M.). A very beautiful and perfectly constant form, apparently of dwarfish habit. It resembles *bimarginatum* (83) in structure, but is a trifle broader, and it produces a pair of broad equal cordate basal lobes. It was raised by Mr. Elworthy, from spores of a very good form of *muricatum* (85).

The following varieties referred to other groups, are also more or less marginate:—*compositum* (14), *marginato-cornutum* (20), *fisso-lobatum* (25), *curtum* (38), *pocilliferum* (44), *resectum* (51), *retiner-vium* (52), *scalpturatum* (87), *multiforme* (125), *lacerato-marginatum* (149), *marginato-laceratum* (150), *ramo-submarginatum* (153), *ramo-marginatum* (154).

Muricatum Series.

85. *muricatum* (M.). This variety may be taken as the type of another kind of variation, in which parallel striæ or ridges or projecting points are developed on the upper surface of the frond. The fronds are normal in size, coriaceous, cordate at the base, attenuate at the apex, the margin somewhat crenately-lobed or sinuous, here and

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there slightly crenate. The upper surface is striately-furrowed, the tissue being sunken between the veins, producing slight but evident parallel furrows, and the veins themselves bear scattered elevated points rather plentifully over the whole frond. It was found by Mr. J. James, of Vauvert in Guernsey, and proves quite constant and very handsome. Similar forms have been found by Mr. Elworthy, at Nettlecombe, and by Mr. R. Bloxam, in the Isle of Wight.

86. *Kitsoniæ* (M.). The fronds of this curious form are a foot long, and about an inch and a quarter broad, cordate at the base, and otherwise also normal in outline, their peculiar characteristics being, that the upper surface is covered with broken obliquely transverse striæ or furrows, similar to those of *muricatum* (85), and in addition there is a raised ridge or excurrent wing on each side of and parallel with the costa, to which it is closely contiguous for the greater portion of its length, becoming slightly removed near the top. It is a fertile form. This was found in Devonshire, by Miss Fanny Kitson, and was communicated by Mr. R. J. Gray.

87. *scalpturatum* (M.). This is a fine and constant form, and when well marked is very handsome. The fronds are a foot long exclusive of the stipites, and from an inch to an inch and a half in width, deeply crenato-lobate; the base is cordate, the apex attenuate, the upper surface irregularly ridgy towards the margin as if the tissue had been irregularly carved, leaving a mass of wavy branching or confused prominent lines; the lobes are sometimes entire, sometimes toothed. The plants are frequently suprasoriferous, and some of the specimens have this character more strongly marked than in any other cases within our knowledge; they are often more or less marginate. The most elegant and characteristic forms have been found in Guernsey, by Mr. James; and at Nettlecombe, by Mr. Elworthy; and in the Isle of Wight, by Mr. R. Bloxam. Mr. James has also sent from Guernsey a form in which the surface is only slightly sculptured at intervals. Another slightly marked form, hardly sufficiently developed, has been sent from Coxwold, Yorkshire, by Mr. C. Monkman.

88. *scalpturato-lobatum* (M.). This is another handsome form like the last, but multifidly lobed at the apex. There are two forms: one rather more irregularly lobed and laciniately-toothed on

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the margin, with the surface near the edge a good deal furrowed, sent from Nettlecombe by Mr. Elworthy; the other crenately-lobed, not toothed, and having distant slightly sculptured ridges, sent from Exeter by Mr. R. J. Gray. They are both plants of ornamental character.

89. *jugosum* (M.). The peculiarity in this variety consists in a thickening of the veins which bear sori, resulting in the production of a series of herbaceous ridges or sorus-like excrescences on the upper surface, opposite to the sori of the lower surface; this feature produces a curious ridgy appearance on the surface. Two or three modifications of this structure have been met with. The most marked was found in Guernsey by Mr. James; others have been met with by Mr. Jackson in Guernsey, and at Barnstaple in Devonshire; Mr. Wollaston has also found the same form at Ottery St. Mary in the latter county. It is rather a capricious form, and sometimes runs out of character in the first or summer growth.

90. *papillosum* (M.). This curious variety developes a series of distinct wart-like excrescences side by side, on the upper surface of the veins, near their apices, forming a kind of border to the fronds; the latter, in the specimens we have seen, being small and rather narrow, but of normal outline. It was sent from Guernsey by Mr. C. Jackson, and, like *jugosum*, is not of fixed character, producing, however, characteristic fronds in the later or autumnal growth.

The following varieties are also more or less muricate:—*submarginatum* (74), *bimarginato-muricatum* (83).

Crispum Series.

91. *crispum* (Willd.). This beautiful variety, one of the oldest forms known, and admired for the elegant frilling of its fronds, is, we believe, always barren. The fronds attain the full size of a foot or more in length, and two to two and a half inches in breadth, the margin being parallel or nearly so, and exquisitely and symmetrically waved or undulated or frilled, the extreme edge being usually more or less crenate; the base is cordate, the basal lobes being often unusually developed so as to overlie each other, and sometimes quite separated down to the costa. Dwarf, truncate,

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cornute, submarginate, or irregularly lobate fronds are produced by this form in Mr. Wollaston's garden; they result, in his opinion, from an injury caused at a very early stage by a small dipterous insect. It has been found in recent times—in Guernsey, *J. James*, *C. Jackson*. Devonshire: Barnstaple, *C. Jackson*. Yorkshire: Byland Abbey, *C. Monkman;* Terrington, *C. M.;* near Doncaster, on magnesian limestone rocks, *J. Hardy*. Cumberland: Furness Abbey, near Ulverstone, *A. Stansfield*. Hampshire, *Rev. W. H. Hawker*. Denbighshire, *Mr. T. Pritchard*. [Plate LXXXIII B.—Folio ed. t. XLII, fig. 4].

—*crispum irregulare* (M.) is a curiously lobate form, the fronds having reniform lobes at the base, sometimes three or four in number, the margin being also here and there divided deeply so as to become irregular, some parts being also laciniate and there submarginate. The fronds are often dwarf, and sometimes horned, with a blunt terminal lobe. It has been sent to us by Mr. Wollaston, and is apparently of garden origin.

92. *crispum latum* (M.). This is sometimes called *crispum majus* in gardens, but is not the variety first thus designated. It is remarkable for the great breadth of its fronds, which measure from three to four inches across, and are somewhat broadest in the centre, and have a tendency to develope the marginal crenatures into short pointed lobes; the base is cordate, one of the lobes sometimes becoming a little pointed, indicating a tendency towards *sagittato-crispum* (8). It has been found in—Devonshire: Barnstaple, *C. Jackson*. Somerset: Nettlecombe, *C. Elworthy*. It is a very fine variety, but of course much resembling the other crisped sorts, chiefly differing in its broader fronds.

93. *crispum majus* (Jackson). This appears to be a distinct form, and a very fine one, but we are only acquainted with it from dried specimens. It seems remarkable for its erect habit, and its six or eight inch long stiff stipites, which, we are informed, are peculiar to it; the costa also is very thick; the lamina is fully a foot long, dark green, the base cordate with very large auricles or lobes, which form the broadest part of the frond, and measure three inches across; above these the frond tapers gradually to the apex, the margins being frilled equally with the preceding forms. It was found in

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Guernsey by Mr. Jackson. This variety has produced irregularly inciso-laciniate fronds in Mr. Wollaston's garden.

94. *crispum minus* (Jackson). A very elegant small much-curled variety, with fronds nine or ten inches long, exclusive of the shortish stipites, and measuring about an inch and a half in width; they are cordate or sub-cordate and somewhat marginate and toothed at the base, frilled and toothed at the margins, which are nearly parallel, with a short acute or sometimes multifid point. It was found by Mr. Jackson in the island of Guernsey.

95. *crispum varians* (M.). This is a broad and variable form, the fronds sometimes resembling *crispum latum* (92) with a simple acute apex, sometimes truncate, sometimes multifid or even ramose some distance down the costa—all these forms being perfect and evenly frilled. It also produces fronds which are completely irregular, being interruptedly lobed, with a very uneven margin, and less perfectly crisped. It is moreover, freely proliferous, producing bulbils every season. This form, a very handsome one, was found near Settle by Mr. A. Clapham of Scarborough. A multifid form of *crispum* has also been sent from Barnstaple by Mr. Jackson.

96. *crispatum* (M.). This is a moderate-sized very much curled variety, and is chiefly remarkable beyond this, among the forms of the true *crispum* character, for being abundantly fertile. The fronds are about a foot long, an inch and a half or when very luxuriant two inches and a half broad, cordate at the base, almost parallel-sided, closely frilled, with an acute or sometimes lobed apex. When growing in a pot and rather starved, we have had it produce narrow fronds, five to seven-eighths in width, slightly crisped, and loaded with sori, but this is not its usual character. It was found by Mr. James in Guernsey, and is very beautiful.

97. *crispatum varians* (M.). A very elegant and variable fertile form, allied to the Guernsey *crispatum*. Its spring-formed fronds are eight to ten inches long, and about an inch and a half broad, lobate and subtruncate and unequal at the base, the margin undulated and dentate, and the apex slightly dilated or multifid. The autumnal growth is broader, three inches wide, the margin fringed with smallish acute projecting lobes or enlarged teeth, similar to those of *laceratum* (145); portions of both these forms of frond are

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sometimes contracted and finely toothed. It was found in the Isle of Wight by Mr. R. Bloxam.

98. *tortum* (M.). A thoroughly distinct and beautiful variety, of dwarfish habit, the fronds being from six to eight inches high, and about an inch and a half broad in the middle, rather narrower above and below, cordate at the base, and multifid crisped at the apex; the margins are finely undulated, but the chief peculiarity is the production of numerous minute projecting pointed lobes which, being curled, have the appearance of being hooked or twisted in all directions; this is more marked in the larger specimens than in the small one, which was more convenient for our illustration. The fronds we have seen are sterile. It was found in Guernsey by Mr. James, and is one of the most charming of recent additions to the forms of this polymorphous species. [Plate XCI *bis*, B.]

99. *crenato-crispum* (Monkm.). This is a large form, nearly a foot long and two inches wide, deeply divided into roundish lobes, as in the more regular forms of *sinuatum* (45), but the margin of the frond is crisped, so that the lobes overlap. It is a fertile plant, and appears quite distinct. It was found by Mr. Monkman, at Kirkham near Malton, Yorkshire, in 1858.

100. *undulatum* (M.). This variety has the margins regularly wavy or curled as in *crispum* (91), but they are considerably less crispy, and the fronds are narrower, and, unlike that, constantly fertile. The fronds are cordate at the base, acute at the apex, the larger ones nearly a foot long, and about an inch and a half wide. The plant is often confounded with *crispum*, and is probably not uncommon. We have information of its occurrence in—Devonshire: Torquay, *R. J. Gray*. Somersetshire: Nettlecombe, *C. Elworthy*. Hampshire: Fareham. Denbighshire: Ruthin, *T. Pritchard*. Yorkshire: Oswaldkirk, Helmsley, *A. Clapham;* Whitby, *J. Willison*. Antrim: Colin Glen, Belfast, *A. Crawford*.

101. *undulato-lobatum* (M.). This differs from *undulatum* only in being several times forked at the apex, the branches of each division spreading and forming a peculiar head of curly segments, but not a cristate tuft. It is an old well-known garden plant and constant. It has been found by Mr. Wollaston at Littlehampton in Sussex, and by Mr. James in Guernsey. Mr. Wollaston has also

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obtained a fine form of this character from Whitbarrow, Westmoreland. This variety is sometimes called *crispum multifidum* in gardens.

102. *undulato-projectum* (M.). This is a curious and constant broad somewhat undulated form, with a cordate base, remarkable for the production of distant projecting pointed marginal lobes, half an inch long or more, and sometimes split into three or four linear tooth-like divisions. It was found at Mulgrave Castle, Yorkshire, by Messrs. Stansfield, of Todmorden.

103. *corrugatum* (Woll.). A very pretty variety, with fronds a foot or more in length, and two inches broad; they are cordate at the base, attenuate at the apex, and elegantly undulated or corrugate on the margin, where they are also somewhat sinuately or sometimes towards the top lacerately-lobate. It is a fertile form, found near the Devil's Punch Bowl, Hindhead, Surrey, by Hillman, a collector, and is in the possession of Mr. Wollaston.

104. *conjunctum* (M.). A very dwarf pretty form. The fronds are six to eight inches high, an inch and a half broad near the base, dividing about half way up into two divisions, and these becoming again forked with multifid apices; the margins are undulated, and the multifid apices of the lobes have their points twisted as in *crista-galli* (142). It was found by Mr. James in Guernsey, and maintains its peculiar features.

105. *complicatum* (Woll.). This is a very neat and interesting variety. The fronds are six inches to a foot or more in length, cordate, sometimes unequal at the base, simple or multifid, with twisted lobes at the apex, sometimes forked in the costa with the branches crossing each other transversely; the margins irregularly crenate, somewhat laciniately-toothed and undulated. The sori are numerous, in narrow approximate lines, which seem to have an irregular direction in consequence of the undulation of the margin. It was found at Chislehurst, Kent, by Mr. Wollaston.

106. *spirale* (M.). This is a very curious dwarf variety. The fronds are from three to five inches long, the broadest about an inch in width, undulate in the lower part, and becoming twisted towards the top in a spiral or corkscrew fashion. This, which proves to be a constant form, rather curious than beautiful, has been found

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in Guernsey by Mr. James; and more recently at Nailsworth in Gloucestershire, by Mrs. Campbell.

Here also may be included:—*sagittato-crispum* (8), *sagittato-laceratum* (9), *Claphamii* (13), and *compositum* (14).

Variabile Series.

107. ***variabile*** (Woll.) This curious form, which as its name implies, has fronds of various size and shape, is a vigorous growing coarse variety, constant to its peculiar characters. The fronds are sometimes nearly normal, with an unequal cordate base, just below which a stalked or sessile distinct reniform lobe or branch is produced. Some fronds are branched in the stipes or near the base, or towards the apex, but are otherwise normal. Others are abbreviated, the apex being either abruptly rounded off or separating into two subreniform overlapping lobes: these abbreviated fronds being sometimes not more than one or two inches long. Sometimes the margin is very unequally divided—once or oftener—almost or quite to the midrib, the divisions forming bluntly rounded or subreniform lobes. The base is usually unequal, and very commonly has one of these lobes an inch or two in length formed there. Some plants have many of the fronds with the stipes divided and bearing two short equal kidney-shaped lobes: which state has been called *bireniforme;* in some fronds of this form sent by Mr. Chanter, the two reniform lobes standing opposite with their sides incurved, produced a goblet-shaped frond. In other cases, the entire frond consists of one of these reniform lobes, dwarf and unequal-sided. Occasionally the fronds are branched, each branch bearing its reniform lobe or lobes. The plants always have the distinct reniform basal branch, sessile or stalked, or the few distant rounded subreniform marginal divisions, but are in other respects often normal, and abundantly fertile, though they are occasionally somewhat undulated, and rarely supralineate. It has been found in—Guernsey, *Dr. Allchin, C. Jackson.* Devonshire: Ilfracombe, *Rev. J. M. Chanter, J. Dodds;* Barnstaple, *C. Jackson.* Somersetshire: Nettlecombe, *C. Elworthy.* Sussex: Littlehampton, *G. B. Wollaston.* Isle of Wight. Lancashire: near Preston, *A. Stansfield.* [Plate LXXXVIII.]

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108. *variabile cristatum* (M.). This is a very handsome form of *variabile* (107), in which the fronds are about six inches long, dividing in the lower part of the costa, and spreading out by repeated contiguous forkings into a bunch six inches across, the tips of the ultimate lobes being curly or cristate. The fronds are fertile in the upper part. It was found near Barnstaple, Devonshire, by Mr. C. Jackson.

109. *subpinnatum* (M.). A curious dwarf form, six inches high, and nearly two broad, the fronds of which are split down to the costa into several irregular roundish or bluntly wedge-shaped lobes, which are frequently distant with an open sinus, but sometimes contiguous and overlapping; the base in one frond before us is unequal, but one lobe being produced, and this separated as in *variabile* (107); and the costa higher up is bared for an interval of nearly an inch, so that the lamina is quite separated. The fronds appear to be sometimes attenuate sometimes abrupt at the apex. It was found at Ilfracombe, Devonshire, by Mr. J. Dodds.

110. *dissimile* (Woll.) This is a vigorous growing form, having fronds exceedingly varied: indeed so unlike each other, that they seem to belong to different plants. They vary in the lamina from two to eight inches in length and are mostly broadish, cordate at the base, simple or lobate at the apex, attenuate or obtuse, sometimes cleft; the margin is here and there irregularly and deeply lobed, indicating an approach to the structure of *variabile* (107), and sometimes there is a distinct reniform lobe at the base. Some fronds are irregularly or interruptedly contracted, and when contracted laciniately-toothed; some are dwarf and truncate, fan-shaped; others bireniform with narrow incised lobes. It was found by Mr. A. Clapham, at Grassington, Wharfedale, Yorkshire; and with him is very proliferous.

111. *abruptum* (M.). The peculiarity of this variety consists in the midvein or rachis rarely reaching to the apex of the frond, which is broad and bluntly rounded. The fronds are variable in size, from two to ten or twelve inches long exclusive of the stipites, cordate or sometimes unequal at the base, usually somewhat undulated; the apex is usually entire, plane or undulated, but it is sometimes divided; and the plants occasionally produce dwarf bireniform

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fronds. In other respects the variety is normal; it is subpermanent, and has been found by Mr. Wollaston at Littlehampton in Sussex; by Mr. Dodds at Ilfracombe, Devonshire; and by Mr. James in Guernsey. [Plate LXXXV A.]

112. *polymorphum* (Woll.) The fronds of this form are very polymorphous, and are generally remarkable for their great breadth. Some are normal; some like *crenato-lobatum* (43), but throwing out a lateral branch almost as large as the main portion; some merely forked near the top; some abruptly rounded and undulated, as in *abruptum* (111), but with an obtuse bulging like an arrested branch at the side or near the base; some with a separated but overlapping reniform lobe at the base: these all from six inches to a foot in length. Some are abbreviated, two or three inches long, the apex split, with subreniform overlapping lobes, or abruptly rounded with an obtuse cone-shaped elongation in the centre; some branched at the base into short forking branches, so that they are either normal, multifid, ramose or truncate, or present two or more of these characters combined. The plants are fertile and constant to these peculiarities. It was found in Sussex by Mr. Wollaston in 1854.

113. *apicilobum* (M.). A singular looking dwarf form, with variable fronds, three or four inches or more in length, and two broad, widest upwards, the costa not extending to the apex, which is blunt and rounded in outline in all the examples we have seen; the base is cordate, and the margin somewhat undulated, sometimes cut in so as to form a rounded lobe, and the apex deeply cut into several obovate lobes. It was found in Guernsey by Mr. J. James of Vauvert.

114. *flavo-tinctum* (M.). A curious form, in which the fronds are elongated and multifid, or abbreviated and abrupt; the base is cordate, and the margin undulate here and there lobed as in *variabile* (107). Its peculiarity consists in the colour of the fronds, which between the veins near the costa are yellowish, the yellowish tinge passing outwards in streaks between the veins. It appears to retain this striate character. The plant was found at Nettlecombe by Mr. Elworthy.

To this group may be added *cornuto-abruptum* (19).

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Multifidum and Ramosum Series.

115. *lobatum* (Deak.). This form is the least developed of the multifid series, and includes all those in which the apex of the frond is forked once or oftener, without becoming crispy or cristate. It is otherwise normal, and is met with in various gradations, but is only subpermanent. The more highly developed forms of this character, branching into five or six or more distinct apices each growing to a moderate size, become the var. *dædaleum* of some of the older books. It is not uncommon.

116. *transverso-lobatum* (M.). A form of *lobatum* not very uncommon, in which the apical lobes are curved laterally so as to cross each other; the lobes are generally again lobate at the apex, very frequently ramose, and more or less crenately lobate on the inner side. It has been found at Nettlecombe by Mr. Elworthy; at Castle Howard, and Gordale Scars, by Messrs. Stansfield; and near Doncaster by Mr. S. Appleby.

117. *plumoso-lobatum* (M.). An interesting form of *lobatum*, in which the frond is narrowed below, and forked towards the apex, the branches again forking once or twice, so that the apex consists of a few attenuated lobes three or four inches long, which curving more or less have the appearance of a plume of feathers. It was found by Mr. Elworthy at Nettlecombe, Somersetshire.

118. *elato-lobatum* (M.). A tall-growing stout erect form of *lobatum*, two feet high, dividing into several branches at the apex; the branches being either divergent or convergent and transverse. It was found at Littlehampton, Sussex, by Mr. Wollaston.

119. *furcatum* (Woll.). This variety has the apex of the fronds split exactly down the midvein, the divisions crossing in a curved manner, and the forks curving like the upper mandible of a parrot: occasionally growing on as in other multifid forms, and dividing in the same way over and over again. The lower portion of the frond is normal. It is cultivated by Mr. Cox of Redleaf.

120. *divaricatum* (M.). This variety, which is normal below, divides near the top into two branches, which spread out at a wide angle; these fork again in the same manner. We have received it

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from Westmoreland, found by Mr. J. Crossfield, and from Oldstead in Yorkshire, found by Mr. C. Monkman.

121. *divergens* (M.). This is a very curious form. The fronds are about three inches high, excluding the stipites, the base being quite normal; near the top they are divided into two wide-spread branches, the breadth at this part being four to five inches; the branches are more or less lobate or multifid at the tips, and their lower margin is normal, but their upper margin forming the extremity of the frond is contracted and toothed as in *obtusidentatum* (29), a short toothed branch being sometimes produced. The plant is sparingly fertile on the normal part of the lobes. It was found at Nettlecombe by Mr. Elworthy.

122. *contortum* (M.). This is a very curious dwarf variety, the fronds about six inches high, cordate at the base, throwing out a branch (sometimes two) two inches long or more on each side, right and left, multifid at the apex with curly or twisted segments, the points of the branches being also sometimes multifid and curly, sometimes attenuate and somewhat twisted; the margin is throughout entire or nearly so, or somewhat irregularly lobed and toothed, in the latter case becoming very slightly submarginate. The fronds are from four to six inches across measuring along the branches, and are very sparingly fertile; their chief peculiarities are the branching at right angles, and the contortion of the multifid points. It was found at Nettlecombe by Mr. Elworthy.

123. *distortum* (M.). This is one of the most singular varieties known to us, the fronds being sometimes almost comparable to gnarled oak trees as regards their general outline. The fronds are from eight to ten inches high, narrow throughout; averaging about half an inch, but unequal; they are sometimes branched halfway down, always more or less multifidly branched near the apex; the direction of the costa is rarely straight, sometimes curving laterally, sometimes flexuous, and the divisions of the apex are variously spread out and curved; the margin is generally irregular as if bitten off, sometimes grotesquely lobate and laciniate-toothed, the lamina here and there more or less interrupted. The fronds are usually loaded with sori; much more irregularly contracted than that represented in our figure, which is selected to show the disturbed netted

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venation; and usually much less prominently toothed. The whole growth is singularly distorted. It was found in Guernsey by Mr. James. [Plate XCI *bis*, A.].

124. *chelæfrons* (Woll.). This curious little plant is of the lobate or multifid group, though from its pigmy size this feature is not at first very evident. The fronds rarely attain a length of four inches, but are more frequently from half an inch to two inches long; the base subcordate, the apex of most of them furcate, producing the shape of a crab's-claw, the lobes curving and overlapping, their external margin being smooth, and the internal crenate or dentate. It was found at Chislehurst, Kent, by Mr. Wollaston.

125. *multiforme* (Woll.). This is a remarkably compound form, and embraces within itself the peculiarities of nearly every known form of variation. The stipites are simple or ramose. The fronds are dwarf or tall, cordate or unequal or truncate at the base, simple lobate or multifid at the apex, sometimes cornute or subulate; the surface marginate, supralineate or undulate; the margin subentire crenate lobate or laciniate, often here and there depauperated; it is so composite and variable that it cannot be better described than by reference to the varieties indicated by the foregoing epithets. It was found some years ago in Guernsey, by Dr. Allchin, and is a permanent form. [Plate LXXXVII B.]

126. *multifurcatum* (M.). A singular dwarf form, truncate at the base, bearing in the lower part a few distant acute linear projecting segments half an inch long or more; higher up the lobes are larger and longer and become multifid, spreading out into numerous flat pointed segments, and the apex is also multifid, the branches being several times divided and the segments short. The frond forms a rather confused mass of small acute lobes. It was found at Orchardleigh Park, Frome, Somerset, by Mr. W. P. Ayres.

127. *multifidum* (Gray). This is a comprehensive title, including all those forms which are normal below, and divided at the apex into several branches, which are multifidly cleft at their points, spreading out into a broadish more or less dense flattish tuft. The plants are not uniformly affected, nor uniformly permanent. It differs from *lobatum* in having the primary apical divisions dilated at the ends, and split into several smaller segments. It is found in

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many places: *e. g.* Littlehampton, *G. B. Wollaston;* Nettlecombe, *C. Elworthy;* Frenchay near Bristol, *T. H. Thomas;* Coninbrough Cliffs, *J. Hardy;* Cumberland, *R. Morris;* Ruthin, *T. Pritchard;* Colin Glen, Belfast, *A. Crawford;* Kilmoganny, Kilkenny, *J. R. Kinahan;* Black Head, Clare, *J. R. K.* [Plate LXXXIX.]

A dwarf broad-fronded variety (*lato-multifidum*, M.) has the fronds six or seven inches long, and two and a half broad in the basal normal portion; the upper part is multifidly divided into numerous segments and more or less repand or subcrenate. It was found at Wood Plumpton near Preston, Lancashire, by Mr. Stansfield.

128. *microdon* (M.). This elegant form bears fronds a foot high, exclusive of the stipites, and about an inch wide; they are cordate at the base, and undulated, subcrenately lobed, and here and there dentate on the margin, the toothed portions being submarginate; the apex is multifid with twisted lobes. One of its peculiarities is the sulcate condition of the upper surface in the upper part of the frond. It was found in Ireland, by Dr. Allchin, and is quite constant.

129. *contractum* (Woll.). This variety has been named on account of having its fronds drawn in or waist-like just below their densely-multifid apices. It is a compactly multifid plant six to eight or ten inches high, cordate at the base and normal in the lower part, densely flabellate-multifid-crisped at the apex, and below the multifid tuft more or less distinctly contracted; in passing this contracted part, the veins become confluent in masses, giving that part a disturbed ridged appearance; the apex also is somewhat submarginate. It was first found in Clare, Ireland, by Dr. Allchin, and is permanent. Similar forms have been met with in Guernsey, by Mr. Jackson; at Smeerset, by Mr. Clapham; at Ruthin, by Mr. Pritchard; at Nettlecombe, by Mr. Elworthy; and a very characteristic seedling, represented in our plate, has been raised by Mr. Clapham. [Plate XCI *bis*, C.]

A small ramose form (*ramoso-contractum*, M.) found by Mr. Jackson, resembles this in its cristate and contracted peculiarities.

130. *polycuspis* (M.). This form is normal below, and multifidly branched at the apex, as in *multifidum* (127), *contractum* (129), and others, the tuft being in many cases very broad and much divided. The peculiarity is that the ultimate divisions are of considerable size:

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in the best forms half an inch to an inch long, flat, and tapering off to a narrow acute point, instead of being dilated and split into little lobes, or cristate. There are some fine old garden plants of this character, sometimes called *cristatum* or *multifidum*.

131. *polycuspis undosum* (M.). A dwarf and apparently narrow variety multifidly-branched, the ultimate segments forming simple attenuate points, but the whole of the multifid part is slightly curled or twisted. It was found by Mr. Stansfield at Giggleswick Scars, near Settle, and by Mr. S. Appleby in the neighbourhood of Doncaster.

132. *flabellatum* (M.). A finely developed flabellately-multifid form, the fronds of which are six to eight inches high, and as much across in the multifid part; the lower half is normal, but in the upper half the costa becomes frequently branched, the branches continuing broad even almost to the extremity, the divisions much overlapping, but scarcely cristate; this tuft of branchlets is spread out nearly flat. It was found near Nettlecombe by Mr. Elworthy.

133. *digitatum* (Woll.). This variety resembles *ramosum* (151), except that its fronds are flat, that is, all its ramifications and divisions are in one plane, so that the fronds are somewhat hand-shaped or fan-like. The stipites are sometimes branched, and the lamina is usually branched both near the base and higher up the costa; the central portion of the frond is excessively ramified into a crowded dense tuft of which the segments are crowded and much overlapping but not crispy, while the branches, often three or four in number, much resemble well-developed fronds of the ordinary *multifidum* (127). It was raised from spores some years since by Mr. Wollaston; and has also been found at South Weald, Brentwood, Essex, by Miss Lucy Moss. Some notion of the wonderfully compound ramifications of the vascular development of this variety, may be formed from the following approximate calculations made from a frond grown by Mr. Wollaston:—

Primary axis	1 stipes.
First series of ramifications . .	3 stipites.
Second series of ramifications . .	9 costæ or midveins.
Third series of ramifications . .	23 costæ or midveins.
Fourth series of ramifications . .	99 costæ or midveins.
Fifth series of ramifications . .	891 branch midveins.
Sixth series of ramifications . . .	2673 veinlets or apical midveins.

Sometimes this variety produces subulate leafless fronds, and these

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are in some instances pronged at the apex, indicating the same ramose character as that which occurs in the more usual state of the fronds. [Plate XC.]

134. *lacerum* (Sim.). This variety is a modification of *digitatum* (133), from which it was raised; it is however permanently unlike it, and has a tendency to be viviparous. The fronds are often branched as in its parent, and they are flabellately multifid, but the divisions, especially of the multifid apex, are often very much reduced in width, and they are frequently again split into very narrow inciso-lobate segments, which gives the appearance of a leaf lacerated or torn into shreds, the irregularly-jagged edges of the segments being marginate. It was raised from spores by Mr. R. Sim, of Foot's Cray, Kent.

135. *depauperatum* (Woll.). A curious deformed variety which instead of fronds, produces little else but their midribs or costæ, which form subulate points an inch or two in length, and either simple, bifid, or multifid. The plants throw up, in the course of the season, one or two large digitate fronds which serve to carry on the functions of life. It is a sport from *digitatum* (133), raised some years since from spores by Mr. Wollaston.

136. *cristatum* (Claph.). This is a very handsome form. The fronds are tall, a foot high exclusive of the stipites, an inch and a half in breadth, the base cordate, the margin entire or subsinuous, and the apex developed into a noble crest or tuft of a peculiar character when perfect. The costa branches near the top so as to form several lobes, which are plain, even on the margin, and soriferous; at their extremity is developed a dense multifid-cristate tuft an inch and a half to two inches in expansion, and eight or ten of these tufts form the apex of the fronds, which are among the most beautiful which are known of this character. In one fine example grown by Mr. Clapham, the base is unequal, and the lamina terminates unequally an inch or so below the ramified apex, the costa being bared; the head in this case consists of seven secondary branches, and measures seven and a half inches across, some of the tufts being fully three inches broad. The frond is normal in its lower parts. It was found by Mr. A. Clapham, near Settle, in Yorkshire.

137. *cristatum ramosum* (M.). A fine subvariety of *cristatum*, with

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the stipites branched, and producing a fine tufted cristate head, but not capitately crested as that is. It has been found at Smeerset, Yorkshire, by Mr. A. Clapham.

138. *cristatum nanum* (M.). A beautiful dwarf crested form. The specimen before us is five inches high including the stipites; the base of the frond, about an inch and a half long, is half an inch wide, cordate, and normal; the frond then spreads out into a repeatedly branched tuft in which the divisions appear narrow throughout, and the ultimate segments terminate in blunt divaricate teeth; this tuft is four inches across. This charming variety was found by Mr. James in Guernsey.

139. *cristatum transversum* (M.). A neat crested form about nine inches high, an inch or more in width, cordate at the base, forked towards the apex with the branches laterally twisted so as to cross each other; these branches are multifid and cristate at the ends. It was sent to Mr. Wollaston, from Minehead, Somersetshire, by Mr. W. Bowden.

140. *Jacksonii* (M.). A very pretty and curious form, having fronds six or eight inches long, more or less narrowed or irregularly contracted, but furnished with unequal rather prominent lobes in the way of *sinuatum* (45), the contracted parts crenate; the base is subtruncate and the apex irregularly branched, the branches themselves irregular at the margins and terminating in every frond in a beautiful tassel or cristate tuft, the tassels forming dense globular masses. It has recently been found at Bideford, Devonshire, by Mr. C. Jackson.

141. *rigidum* (Woll.). This is a bold looking variety, and is especially remarkable for the rigid or wiry character of its stipites, which are sometimes simple sometimes ramose; the costa also is remarkably stout and stiff. The fronds, exclusive of stipites, are about a foot long, two or two and a half inches broad, cordate at the base, more or less multifid at the apex, with crispy or twisted segments; the margins are usually nearly parallel, obscurely crenate, or sometimes irregularly serrate-dentate especially in the upper part; sometimes there are a few deep rounded lobes as in the *variabile* group. There is a slight tendency to become supralineate. It was found at Littlehampton, Sussex, by Mr. Wollaston.

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142. *crista-galli* (Woll.). This handsome variety is allied to *multifidum* (127), but differs from it in the apex being a complicated folding rather than a complicated dividing of its parts. The fronds are a foot or more in height, one and a-half to two and a-half inches broad, cordate at the base, somewhat undulated below, the margin crenate, the apex forming a compactly crispy tuft. It is a permanent form and reproduces itself from its spores. The original plant was found some years since at Glanville's Wootton, in Dorsetshire, by Mr. Wollaston; and it has also been found at Nettlecombe by Mr. Elworthy; at Malham by Mr. Stansfield; and on Whitbarrow by Mr. F. Clowes: the latter sometimes produces dwarf irregularly lobed turgid net-veined multifid-crisped fronds. Mr. Wollaston has raised from this a striped variety, which however is not permanent.

143. *glomeratum* (M.). This is a very distinct and very beautiful variety. The fronds are three to six inches high, and are entirely without any normal plane or strap-shaped portion, but the costa divides over and over again in so dense a manner that a perfectly globular crispy mass is produced, the margins of which are obtusely and obscurely crenate-lobed. It was found in Jersey by M. Picquet, and was communicated by Mr. C. Jackson. When in its true character this is one of the finest varieties known, but it occasionally produces a normal frond.

144. *ramoso-glomeratum* (M.). This also is a beautiful dwarf variety, ramose in the stipites, producing several branches which are again ramose from the very base of their lamina, branching out into several divisions which are so much dilated that they form rounded densely crisped obtuse-looking tufts with bluntly crenated margins. The whole frond consists of a series of five or six of these dense glomerate frilled masses, all brought together into one head. It was found by Mr. James in Guernsey, and is perhaps the most rare and beautiful of all the ramose forms. A ramose viviparous seedling raised by Mr. Clapham, somewhat approaches this in character, being repeatedly divided with obtuse tufts, but is apparently less densely crisped.

145. *laceratum* (M.). This remarkably fine variety is sometimes known in gardens under the names of *palmatum*, *serratum*, and *endiviæfolium*. The fronds are variable, often short and broad, six

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to eight inches high, and three inches broad above the still wider base, sub-deltoid, the margin deeply inciso-lobate, the lobes crowded, elongate, tapered, or multifid-crisped at their apices. Sometimes they are taller and narrower, with elongate branch-like lobes right and left at the base, producing a hastate character, the margin inciso-lobate, with narrow elongate, tapering and projecting lobes, and the apex either slightly or very densely multifid-crisped; the basal lobes are sometimes as much as four inches long, an inch wide, and expanded into a multifid cristate tuft nearly two inches across. The numerous projecting lobes, and the deeply incised subpinnatifid margin, combined with the multifid-crisped character, are the distinguishing features of this very handsome variety. It was first found at Taunton, in Somersetshire, by Mr. J. Young; and a very similar form has been found in Yorkshire, by Mr. A. Clapham, of Scarborough. It has now become a common garden plant. [Plate XCII.—Folio ed. t. XLII, fig. 10].

146. *laceratum dissectum* (M.). This is a dwarf plant four to six inches high, and is remarkable for its dissected fronds, which are sometimes flabellate, as broad as long, and divided down to the costa into three segments, which are again deeply split into broad cuneate inciso-dentate segments; or they are short oblong, with long basal lobes, thus somewhat hastate, and the upper part split deeply into segments. Sori are produced on the margins of the sinuses. It is a seedling raised by Mr. Elworthy.

147. *laceratum elegans* (M.). The fronds of this curious variety form an irregular mass six inches high and four inches across; they are divided in an irregular manner quite down to the costa into several divisions which are again deeply cleft-lobed, dilated and crispy at the apices. It has been raised by Mr. W. Willison, of Whitby.

148. *lacerato-ramosum* (M.). A pigmy form, very singular if it remains permanent. The fronds sent to us are two inches high, two inches across, two or three branched in the stipites, the branches forked once or twice in a multifid manner, the ultimate divisions being blunt and dentate. The fronds are slightly marginate beneath. It is a seedling raised by Mr. Elworthy, and is exceedingly curious. Another similar pigmy ramose form, more flabellate in the branches, has been raised by Mr. Elworthy; and a third, rather larger and

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more open in the parts, the divisions being deeper cleft with more open sinuses, has been obtained by Mr. W. Willison.

149. *lacerato-marginatum* (Sim). A dwarf form of *laceratum* (145), about three inches high and two inches across, the apex cleft, blunt, inciso-lobate, and somewhat marginate. It is a constant form, and was raised by Mr. Sim of Footscray.

150. *marginato-laceratum* (Claph.). A remarkable form raised from *laceratum* (145). Some of its fronds resemble the dwarfer fronds of the parent, but are more deeply cleft, while others are split down to the costa in a variety of ways, the divisions forming distant separated lobes of various size, and altogether irregular in form: some being oblong with sinuous margins, some obtusely-wedge-shaped, others broader irregular variously cleft and more or less multifid-crisped, the parts being all more or less marginate. In some fronds the costa is bare to near the top, and the frond then becomes fan-shaped, with small narrow unequal divisions. One frond when spread flat forms about three parts of a circle of five inches diameter, and consists of five wedge-shaped sections divided down nearly to the top of the stipes, each section being several times deeply cleft, with margins lacerately lobed or toothed. It was raised from spores by Mr. A. Clapham. [Plate XCII *bis.*]

151. *ramosum* (Willd.). This is an old variety, known since the time of Plukenet, and one of the most beautiful yet discovered. The fronds which are short and dense, consist of a multiplication of furcations, the stipites which start singly from the caudex becoming ramified like the limbs of a tree, the costa often again branched below, and each branch bearing a dense multifid-crisped tuft; the apex of the frond is ramified at least two hundred fold, in some instances. It is a very old and somewhat rare garden variety; but similar plants have recently been found by Mr. C. Jackson, in Guernsey, and by the Rev. J. M. Chanter, at Ilfracombe in Devonshire. It is uniformly constant, and reproduces itself by its spores.

152. *ramoso-cristatum* (Claph.). This is yet but an undeveloped seedling, but appears to be a fine variety. The fronds are ramose, the apices of the branches multifid, a portion of the segments being cristate and curly, and others forming flat projecting lobes. It has been raised by Mr. A. Clapham.

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153. *ramo-submarginatum* (M.). This is one of the seedlings raised by Mr. A. Clapham from *submarginato-multifidum* (76) and is a broadish form, eight or ten inches high, ramose in the stipes or branched in the lower part of the costa, the plane portion of the lamina an inch or more in width, and the apex of the branches developed into a large multifid-crisped submarginate tuft. It is in fact very much like *ramosum* (151) but is submarginate.

154. *ramo-marginatum* (Claph.). A very beautiful and distinct variety, part of the progeny of *submarginato-multifidum* (76). The fronds are from six to twelve inches high, ramose in the stipites, and usually nearly uniform in character; the branches produce a more or less lengthened plane portion, which is of variable width but much narrowed, seldom exceeding half an inch in width, and usually much less, mostly becoming a little expanded and subcordate at the base; the apex of the frond or branch spreading into a flattish crispy flabellate head, consisting of repeatedly-branched narrowish marginate segments, having the sinuses usually open, and the segments overlapping; these crested heads are from three to five inches across. The fronds are occasionally somewhat more irregularly multifid at the top; and sometimes they are simple, a small proportion of the fronds before us having the lamina three inches long, and scarcely wider than the stipes, and then forming the multifid head. It was raised from spores by Mr. A. Clapham; and a seedling of similar character has been sent to us by Mr. Elworthy. [Plate XCI.]

155. *ramosum majus* (Claph.). This is quite unlike *ramosum* (151), but has been named in allusion to its branching stipites. The fronds are very vigorous, a foot and a-half in height, remarkable for the great thickness of the stipites, which seem as if they were each a combination of two or three united in one; these stipites are branched, either below or near the top, or both, so that several fronds seem to branch out from their summit. The fronds or branches are broad, cordate below, attenuate at the apex, somewhat undulated and crenated, not unfrequently curving laterally so as to cross each other. The seedlings from it are more or less multifid. The original plant came up accidentally in the Camellia house of Mr. Clapham, of Settle, Yorkshire. It is quite constant to its peculiarities. Another and better form, much more decidedly mul-

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tifid, with one-half of the tufts crossing the other, as in *transverso-lobatum* (116), has been found by Mr. E. Woodall, at Haburn Wike, Scarborough.

This multifid series would also include the following additional varieties which are referred on account of other peculiarities to some of the foregoing groups:—*detectum* (2), *hastatum* (6), *sagittato-crispum* (8), *sagittato-cristatum* (11), *sagittato-lobatum* (12), *Claphamii* (13), *fisso-lobatum* (25), *furcans* (36), *curtum* (38), *supralineato-lobatum* (58), *marginato-lobatum* (63), *marginato-cristatum* (64), *ramo-proliferum* (67), *bimarginatum* (82), *scalpturato-lobatum* (88), *undulato-lobatum* (101), *complicatum* (105), *variabile cristatum* (108).

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Genus IX: CETERACH, *Willdenow.*

Gen. Char.—**Sori** linear oblong, obsoletely indusiate; the **receptacles** lateral, occupying the anterior (*i. e.* anterior as regards the segments) side of the veins, or posterior in the basal sori of each segment, at first hidden amongst densely imbricated chaffy scales. **Indusium** obsolete: "linear narrow plane sometimes obsolete" (*Hook.*). **Veins** forked, from a central costa; **venules** sub-parallel, soriferous below, anastomosing irregularly near the margin, the basal anterior ones (*i. e.* anterior as regards the frond) soriferous on the side next the rachis or primary costa; marginal **veinlets** mostly free.

Fronds pinnatifid, coriaceous, densely clothed beneath with imbricated chaffy scales.

Caudex short, erect, tufted.

This genus is one of anomalous character, having peculiarities in its fructification which seem to unite it both with the *Asplenieæ* and the *Gymnogrammæ*. Thus, it agrees with the latter group in having the sori destitute of an evident indusium, this organ being represented, according to the observations of some botanists, by a slightly elevated membranous ridge behind the sorus. Mr. W. Wilson finds evident traces of an involucre on the lower side of the sorus, namely, a "narrow membrane fringed with the same chaffy scales which cover the back of the frond."* Dr. Deakin, who states † that he has examined with great care many specimens at different periods of development, finds only a slightly elevated or narrow projecting line, which can at most be called an obsolete indusium; and this disappears at a later stage. Even this, however, is not always to be seen, or at least cannot always be satisfactorily made out. The cover to the sorus, which is one of the marks of the *Asplenieæ*, may therefore be said to be constantly in an abortive state, if not absent, and hence it is described as being obsolete.

* Hooker, *British Flora*, 5 ed. 436.

† Deakin, *Florigraphia Britannica*, iv. 83.

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This condition of the sorus renders it easy to confound the fructification of *Ceterach* with the truly naked sori of the *Gymnogrammæ*. The affinity of the *Ceterach* is, however, undoubtedly rather with the *Aspleniæ* than with the *Gymnogrammæ*, notwithstanding the anomalous condition of its indusium, as is evidenced by the lateral position of the spore-cases, which are developed on the side of the receptacular vein, as in the true *Aspleniæ*, and not on the back of the vein, as in *Gymnogrammæ*. Though the indusium has not, we believe, been detected in anything like a perfect condition, we have occasionally found both in the native British species, and in another occurring in the Atlantic Islands, the small incomplete cover noticed by other observers, forming a narrow membranous ridge standing behind the line of spore-cases. We have consequently no scruple in placing the genus in the neighbourhood of *Asplenium* and *Scolopendrium*, as an anomalous or imperfect form of the group to which they belong. The thick coating of scales which invests the soriferous surface of the plant, may be a sufficient explanation of the obsolete condition of the proper cover to the spore-cases. The foregoing is, moreover, the view taken by Mr. J. Smith, who considers that the lateral sporangia clearly point out the relationship of *Ceterach* to be with *Asplenium*, rather than with any of the grammitoid genera; the absence of the indusium being entirely owing to its being suppressed by the density of the scales.

Only two species of this genus are known; the common one, which is widely dispersed, and a large growing kind found in the Canaries and other Atlantic Isles. Two South African species having some resemblance to them in appearance from their being clothed in a similar way with chaffy scales, have free veins and dorsal naked sori, and are accordingly referred to the genus *Grammitis*.

The generic name is derived from *Chetherak*, which was the name applied to the common species by the Arabian and Persian physicians, among whom the plant was esteemed for its supposed medicinal virtues.

BRITISH SPECIES.

C. officinarum: a dwarf perennial, with pinnatifid fleshy fronds, clothed with overlying scales beneath.

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THE COMMON SCALE FERN, or SCALY SPLEENWORT.

CETERACH OFFICINARUM.

C. fronds coriaceous, narrow lanceolate, sinuate-pinnatifid, sometimes pinnate below; segments oblong obtuse, entire or sinuately-lobed, densely scaly beneath. [Plate XCIII A.]

CETERACH OFFICINARUM, *Willdenow, Enum.* 1068; *Id., Sp. Plant.* v. 136. *Gray, Nat. Arr. Brit. Pl.* ii. 4. *Hooker, Gen. Fil.* t. 113 A. *Hooker & Arnott, Brit. Fl.* 7 ed. 580. *Babington, Man. Brit. Bot.* 4 ed. 427. *Dealtin, Florigr. Brit.* iv. 81, fig. 1599. *Newman, Hist. Brit. Ferns,* 2 ed. 293. *Moore, Handb. Brit. Ferns,* 3 ed. 214; *Id., Ferns of Gt. Brit. Nature Printed,* t. 43 A. *Sowerby, Ferns of Gt. Brit.* 62, t. 36. *Link, Fil. Sp.* 144. *Fée, Gen. Fil.* 206, t. 30 A, fig. 2. *Bentham, Handb. Brit. Fl.* 634. *Heufler, Aspl. Europ.* 110. *Nyman, Syllog. Fl. Europ.* 433. *Mettenius, Fil. Hort. Bot. Lips.* 80, t. 13, fig. 13. *Lowe, Nat. Hist. Ferns,* v. t. 54.

ASPLENIUM CETERACH, *Linnæus, Sp. Plant.* 1538. *Bolton, Fil. Brit.* 20, t. 12 (bad). *Lightfoot, Fl. Scot.* 661. *Sturm, Fl.* (Farrn.) t. 6.

ASPLENIUM SINUATUM, *Salisbury, Prod.* 403.

SCOLOPENDRIUM CETERACH, *Symons, Syn. Plant.* 193. *Smith, Eng. Bot.* xviii. t. 1244; *Id., Eng. Fl.* 2 ed. iv. 302. *Roth, Fl. Germ.* iii. 48.

VITTARIA CETERACH, *a, Bernhardi, Ueber Asplen.* (*Act. Erford.* 1802) 15.

GYMNOPTERIS CETERACH, *Bernhardi, Schrad. neues Journ. Bot.* 1806, i. part 2, 22.

GRAMMITIS CETERACH, *Swartz, Syn. Fil.* 23. *Schkuhr, Krypt. Gew.* 186, t. 7, *b. Mackay, Fl.-Hib.* 337. *Hooker, Brit. Fl.* 1 ed. 441. *Koch, Syn.* 2 ed. 924. *Loddiges, Bot. Cab.* t. 15.

GYMNOGRAMMA CETERACH, *Sprengel, Syst. Veg.* iv. 38 (excl. syn. *Grammitis aurea,* etc.). *Presl, Tent. Pterid.* 219, t. 9, fig. 10 (venation incorrect). *Ledebour, Fl. Ross.* iv. 507. *Sadler, Fil. Hung.* 15.

BLECHNUM SQUAMOSUM, *Stokes, Bot. Mat. Med.* iv. 617.

NOTOLEPEUM CETERACH, *Newman, Hist. Brit. Ferns,* 2 ed. 9; 3 ed. 277; *Id., Phytol.* 1851, *App.* v.

CETERACH CETERACH, *Newman, Phytol.* 1851, *App.* v., in obs.

Caudex short, tufted, scaly. *Scales* ovate-lanceolate, finely reticulate-venose, dark brown. *Fibres* branched, numerous.

Vernation circinate.

Stipes short, from half an inch to three inches long, terminal and adherent to the caudex, dark-coloured at the base, furnished with numerous ovate-lanceolate peltately attached scales, of a pale tawny colour, beautifully venose with close black reticulations.

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Fronds numerous, from an inch and a-half to six or eight inches long, fleshy-coriaceous; linear lanceolate, deeply pinnatifid, often pinnate below; deep green and smooth above, densely clothed beneath with ovate-acuminate, slightly ciliated, tawny reticulately venose, closely-imbricated scales. *Lobes* oblong, obtuse, sessile and adnate by their whole base when distinct, more usually dilated on both sides and connected at the base, margined with projecting scales of the under surface.

Venation indistinct in consequence of the thick texture of the frond, consisting of a sinuous *costa* or midvein, which enters the lobe from near the lower angle; from this is given off, close to the base on its anterior side, a *vein* which is several times forked, while the rest of the veins are alternate and two or three times forked; the branches or *venules* anastomose here and there beyond the second furcation, near the margin, the ultimate marginal *veinlets* being usually free, but sometimes united.

Fructification produced over the whole under surface. *Sori* linear oblong, borne on the anterior side of the anterior venules, above the first fork, except in the case of the lowest anterior vein, which is frequently bisoriferous, one sorus being as usual on the anterior side of its anterior venule, the other on the posterior side of its posterior venule towards the primary costa; they are at first hidden by the dense covering of scales, which eventually they burst through. *Indusium* obsolete, sometimes represented by a narrow membranous line or ridge. *Spore-cases* roundish obovate. *Spores* roundish or somewhat oblong, muricate.

Duration. The caudex is perennial. The fronds are persistent and long enduring, and the new ones appear about May, long before the older ones have perished.

Among the British Ferns, this plant may be recognised by its dwarf tufted sinuate-pinnatifid thick-textured fronds, of which the upper surface is smooth and dark green, and the under surface invested with a close covering of tawny scales. The sori of this plant, as we have already remarked, are said to have a narrow indusium behind them, and as the spore-cases grow laterally on the vein which forms the receptacle, it has, no doubt correctly, been considered

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to belong to the *Asplenieæ;* but we have never been able to find in the British plant, though we have in the larger species found in the Canary Isles, an evident and indisputable indusium. The dense clothing of scales may perhaps prevent the formation of this organ, which is doubtless represented by the raised membranous ridge which may sometimes be observed behind the line of spore-cases.

The Scaly Spleenwort, Scale Fern, or Miltwast, under each of which names the plant is known, grows usually on walls and ruins, less frequently on calcareous rocks, and rarely epiphytal. This Fern is generally dispersed over England and Wales, abundant in the West and North-West, and much less frequent on the Eastern side. In Ireland it is local but abundant, most so in the West, occurring, according to Prof. Kinahan, sometimes on granite rocks, sometimes on clay slate. In Scotland it is somewhat rare, occurring, however, in the Lowlands, in Perthshire, in Argyleshire, and Iona, but apparently absent from the Orkney and Shetland Isles, and from the Outer Hebrides. It is found in Jersey. The altitudinal range over which it is distributed is computed to extend from the sea-level to an elevation of about 600 feet. Some of the habitats which have been recorded are here enumerated:—

Peninsula.—Cornwall: Trevenna; Truro; Newlyn; Pentillie Castle, *Miss Warren;* Calstock, by the Tamar, *Rev. H. Pinnock.* Devonshire, frequent in S., rare in N.: Topsham; Tavistock; Totness, *C. Scott;* Torquay, *Miss Griffiths;* Kentesbury Church, *Miss Griffiths;* Marwood, *Rev. F. Mules;* Bideford; Lynmouth, *R. J. Gray;* Babbicombe; Plymouth, *H. C. Watson;* Chudleigh, *R. J. Gray,* &c. Somersetshire, abundant: Forscote, near Bath, abundant, *Rev. E. Bosanquet;* Nunney; Martock, *T. H. Cooper;* Bristol, *Ray;* Bream Down, *E. Lees;* Selworthy; Ashton; Clevedon; Cheddar, *Sir W. C. Trevelyan, Bart.;* Weston-super-Mare, &c.

Channel.—Hampshire: Winchester Cathedral and elsewhere; Pitt near Winchester, epiphytal, *W. R. Smith;* Netley Abbey, *T. B. Flower;* Selborne Church, *H. G. Johnson;* Breamore Church, *W. Moore;* Old Alresford Church; Titherly, *E. T. Bennett;* Botley, *W. W. Reeves,* &c. Isle of Wight: Brading; Carisbrooke Castle;

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Cooper's, near Bembridge, *Dr. Bromfield*, &c. Dorsetshire: Sherborne, *E. Newman;* Poxwell Church, *Miss Wells.* Wiltshire: Corsham, and other parts. Sussex: Goodwood, *W. Borrer;* Pulborough; Enfield; Hurstpierpoint; Danny, near Brighton, *Rev. T. Rooper;* Stopham; Marden; Brightling; Chailey, *E. Jenner*, &c.

Thames.—Hertfordshire: Ashridge. Middlesex: Brook House, Hackney, *Martyn.* Kent: Riverhead, *H. L. Jenner;* Maidstone; Swanscombe Church; Shorne Church, and various parts. Surrey Westbrook and Catteshall, near Godalming; Haslemere; Farnham. Berkshire: Pusey, *E. Newman.* Oxfordshire: old wall, near Cowley, *W. Baxter.* Essex.

Ouse.—Norfolk: Heveringham Church, near Norwich, *Miss Rackham;* Heydon Church, *Rev. H. Briant.* Suffolk: Bury. Northamptonshire.

Severn.—Warwickshire: Tachebrook; Coventry. Gloucestershire, abundant: Stapleton, *T. B. Flower;* Clearwell, near Coleford, *Miss Brown;* Chepstow; Deerhurst Church, near Tewkesbury, *E. Lees;* Cherewell, Forest of Dean, *E. Lees;* Cheltenham; Tocknells near Painswick; Cirencester, *E. Newman*, &c. Monmouthshire: Tintern Abbey; Pont-y-pool; Welch Bignor, *E. Lees*, &c. Herefordshire: Hereford; Whitchurch, *E. Lees;* Glewstone, near Ross, *W. H. Purchas;* Leominster, *E. Newman*, &c. Worcestershire: Malvern Abbey, *W. Christy;* Badsey, near Evesham, *T. Westcombe;* Wychwood Forest. Staffordshire: Wetton; Glutton; Berresford; Beeston Tor, &c. Shropshire: Ludlow, *J. S. Bayly.*

Trent.—Nottinghamshire: Colwick Park, *J. T. Sidebotham;* Paplewick. Derbyshire: Dovedale, *T. S. Scholes;* Newton, near Melbourne, *Rev. A. Bloxam;* Lath-kill Dale, *J. E. Bowman.*

Mersey.—Cheshire: Carr Edge. Lancashire: near Lancaster, *W. Wilson;* Club Moss, near Liverpool, *S. Thompson;* West Houghton, *W. Wilson;* Kellet, north of Manchester, *W. Wilson;* Burrow.

Humber.—Yorkshire: Rocks above Malham Tarn, *Dr. Richardson;* Kirklees Park, near Halifax, *J. Tatham;* about Settle, *J. T.*

Tyne.—Northumberland.

Lakes.—Westmoreland, abundant: Arnside Knot, *Miss Beever;* Milnthorpe; Scout's Scar, near Kendal, *S Thompson;* Kendal

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Castle; Crosby; Ambleside, *Miss S. Beever*, &c. Cumberland: Gosforth, *J. Robson;* Keswick, *Miss Wright;* Sandwith; St. Bees, *Rev. G. Pinder;* Yew Crags, and Airey Beck, Ullswater. N. Lancashire: Silverdale, *T. Simpson.*

S. Wales.—Brecknockshire: Brecon; Talgarth; Crickhowell, *J. R. Cobb.* Glamorganshire: Aberdare; Caerphilly Castle; Cardiff, *F. Brent;* limestone rocks opposite the Mumbles, *E. Lees;* Swansea; Gower; Pennard Castle, *T. Westcombe*, &c. Carmarthenshire. Pembrokeshire: Tenby, *R. Kippist;* Pembroke and Manorbeer Castles, *E. Lees;* Haverfordwest Priory.

N. Wales.—Anglesea: Holyhead. Denbighshire, rare, *J. E. Bowman;* Ruthin, *T. Pritchard;* Denbigh, *T. P.;* Glen Conway, plentiful, *T. P.* Merionethshire: Barmouth. Carnarvonshire: near Carnarvon; Treborth, *W. Wilson*, and elsewhere about Bangor; between Bettws-y-Coed and Pentre Voelas, on Carnarvonshire side of the Conway, *W. Pamplin.*

E. Lowlands.—Berwickshire: Renton, *J. Macnab.*

W. Lowlands.—Dumfries-shire: Drumlanrig. Kirkcudbrightshire, *W. G. Johnstone*: Orchardton Buit; Old Orchardtown, *H. G. Johnson.* Renfrewshire: Dundonald, near Paisley, *Dr. Young.* Lanarkshire: Glasgow.

E. Highlands.—Perthshire: Kinnoul Hill, *Lightfoot;* near Annat Cottage, *G. Lawson;* Dens of Balthayock and Pitroddie; Carse of Gowrie, *J. Macnab.*

W. Highlands.—Argyleshire: Kilfinnan, *S. Murray.* Iona.

Ulster.—Antrim: Galgorm; Cave Hill. Tyrone: near Cappagh, *J. R. Kinahan.* Down: Bryansford, *W. Thompson;* Rostrevor, *A. Crawford.* Fermanagh: Florence Court, *Hon. J. L. Cole.*

Connaught.—Sligo: Drumahore, Friarstown Abbey, near Sligo, *J. T. Syme.* Galway: Oughterard; Round Tower of Roscommon between Galway and Oughterard; Headford; Gort, *J. R. Kinahan;* Burren, *J. R. K.;* near Mohir; and many other parts. Arran Isles, *W. Andrews.*

Leinster.—Louth: Townley Hall, *C. L. Darby.* Dublin: Marlay, on granite, *S. Foot;* Lucan, *W. H. Luscombe;* Belgard to Saggart, abundant, *J. R. Kinahan;* Whitechurch, *J. R. K.* Wicklow: Glendalough; Enniskerry, *J. R. Kinahan.* Queen's

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County, *J. R. Kinahan.* Kilkenny: Marble quarries at Kilkenny, *Dr. Mackay.*

Munster.—Waterford: between Clonmel and Waterford, *E. Newman;* Ardmore, on clay slate, *J. R. Kinahan;* and many other parts. Tipperary: Lorrha, rare, *J. R. Kinahan;* Nenagh, common, *J. R. K.* Clare: Castle-Connel, *E. Newman;* Tullagh, *J. R. Kinahan;* and elsewhere. Cork: Fermoy, *E. Newman;* Cork; Youghal, on clay slate, *J. R. Kinahan,* &c. Limerick, *E. Newman.* Kerry: about Killarney; near Valentia, rare, *J. R. Kinahan.*

Channel Isles.—Jersey.

This Fern does not apparently extend further north than Scotland, but it is spread thence over the centre and south of Europe, through Holland, Belgium, France, Switzerland, Germany, Italy, Spain, Portugal, the Balearic Isles, Dalmatia, Croatia, Hungary, Transylvania, Greece, and Turkey, to the Russian government of Tauria. In Asia it is found on the Siberian side of the Ural Mountains; in the Caucasus; in Armenia at Erzeroum; in India, at Kashmir, Affghanistan, and Thibet, and at Kulu in the Punjab. In Africa it occurs at Algiers, as well as in S. Africa; and in Madeira, the Azores, the Canaries, and the Cape de Verd Islands. According to Kunze it is also found in Brazil. The *Ceterach canariensis* of Willdenow is much larger in its parts than even the largest forms of our English plant, and is probably a distinct species. In this latter we have found the indusium to be sometimes more evident than in the common British plant.

The *Ceterach* grows with tolerable freedom in rough porous soil, which should consist of sandy loam, and should contain a considerable amount of fragments of limestone, or old lime or mortar rubbish. It must be kept rather dry than otherwise, and must never be subjected to a confined damp atmosphere. It may be cultivated in pots, for which its small size well adapts it; or it may be advantageously planted out on rockwork, if the situation is not too damp and confined. The plants are very impatient of having their fronds wetted, when grown under artificial coverings. Some cultivators recommend the use of old cow-manure, and altogether a more liberal

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treatment than is usually given to this plant, and very fine specimens have been thus produced; but under such treatment more than ordinary caution is necessary not to apply too much water. The plants may be increased when necessary by division.

The antiquated medicinal reputation which this fern possessed has not been maintained in modern times. A marvellous influence over the spleen was at one time attributed to it, and Vitruvius relates that it had the effect of destroying that organ in certain Cretan swine which fed upon it. Hence, doubtless, the origin of the name Miltwaste, which seems to have been first used by Turner, in his *Herbal* (1551); "I have heard no English name," he writes, "of this herbe, but it maye well be called in English Ceteracke, or Miltwaste, or Finger ferne, because it is no longer than a manne's finger, or Scale ferne because it is all full of scales on the inner syde." The opinion of its 'miltwasting' property continued to be held up to the time of Gerard, who writes:—"There be empiricks or blinde practitioners of this age, who teach that with this herbe not only the hardness and swelling of the Spleene, but all infirmities of the liver, may be effectually and in a very short time removed. * * But this is to be reckoned amongst the old wives' fables, and that also which Dioscorides telleth of, touching the gathering of Spleenewort in the night, and other most vaine things which are found here and there scattered in old books." The plant, though now generally neglected, has more recently been considered efficacious as an application to wounds and ulcers; and according to Dr. Deakin,* who states that it was also used as a diuretic, it is still retained in the list of officinal plants in Italy. It has also some economical value, being used as a bait for rock-cod fishing on the coast of Wales.

The species does not vary much except in size; though fronds with a divided apex, an uncertain development, are not unfrequent. There are one or two other forms which may be recorded, namely:

1. *crenatum* (M.). This form has the margins of the lobes distinctly crenate-sinuate, and is usually larger than the common

* Deakin, *Florigraphia Britannica*, iv. 83.

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form. It is met with in various localities, and usually of large size, but being also sometimes found quite small, it is not a mere result of luxuriant growth, as has been supposed. This is the var. *sinuatum* of Dr. Kinahan. We have seen this form, from—Westmoreland: Arnside Knot; Ambleside, *Miss Beever*. Cumberland: Keswick, *Miss Wright*. Brecknockshire: Crickhowel, *J. R. Cobb*. Devonshire, *R. J. Gray*. Perthshire: Kinnoul Hill, near Perth, *T. Wilcke*. Kirkcudbrightshire: *W. G. Johnstone*. Clare, *Dr. Allchin;* Black Head, *R. Barrington*. Galway: Ruins of King John's Castle, *R. Barrington*. West of Ireland, *A. G. More*. Carbery Island, *Capt. A. S. H. Lowe*. Waterford, *J. R. Kinahan*. [Plate XCIII B.]

2. *depauperatum* (Woll.). The fronds of this form are variable; some are irregularly sinuate-pinnatifid, some bifurcate at the apex, some tapering to an acuminate point, and others cornute; the segments are very much depauperated, and occasionally almost wanting, in which case the fronds present the appearance of a sinuately winged rachis. The forms of this variety have been met with chiefly in Ireland, where it was first found by Dr. Allchin; the most remarkable of them was gathered by Lieut.-Col. Buchanan at Kilkenny.

3. *ramosum* (M.). A curious dwarf form, about a couple of inches in height, the fronds dividing into two at the top of the stipites, the branches resembling small normal fronds; sometimes they are dilated upwards instead of lengthened, so as to become nearly obcordate in outline with the margin scarcely at all divided. It has been sent from Ilfracombe by Mr. J. Dodds.

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Genus X: BLECHNUM, *Linnæus.*

Gen. Char.—**Sori** indusiate, linear, continuous or rarely interrupted, seated on a transverse **receptacle**, approximate to the costa; sometimes central or submarginal by the contraction of the fronds. **Indusium** linear, opening along the inward side. **Veins** of the sterile fronds simple or forked from a central costa, the **venules** direct, free, thickened at the apex; those of the fertile fronds combined near the base or within the margin of the transverse receptacle.

Fronds simple pinnatifid or pinnate, subcoriaceous, the fertile sometimes more or less contracted.

Caudex short, erect, often producing elongated creeping stolones.

This genus is closely allied to an exotic one named *Lomaria*, in which the fertile fronds are always contracted, and thus have an entirely different aspect from the sterile ones. There are several species of *Blechnum*, the native British one among the number, which having contracted fertile fronds, and altogether the aspect of *Lomaria*, have been sometimes referred to that genus. This narrowing of the fertile parts is met with, moreover, in various degrees, so that it is necessary to understand what are the technical differences between the two genera, in order to ascertain the proper position of such osculant species. We do not adopt the opinion that the two groups should be united.

The distinction between *Lomaria* and *Blechnum* becomes easy when full force is given to the technical characters assigned to each respectively. The peculiar characteristic of *Lomaria* is that the sori are produced at the margin; whilst the characteristic of *Blechnum* is to have the sori distinctly within the margin, and near to the costa. Thus in technical and exact terms the sori in *Lomaria* are marginal, and in *Blechnum* costal or intramarginal. The fructification of *Lomaria* is determined by the indusium being a continuation of the margin of the frond, which becomes membranaceous, and is inflected over the spore-cases. The fructification peculiar to

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Blechnum on the other hand is known by the indusium springing directly from the under surface of the frond, the margin extending beyond it. This is a clear and intelligible difference, and the genera are only satisfactorily divided when these peculiarities are allowed to have full force.

In many or indeed most of the exotic species of *Blechnum*, the difference is obvious, on account of the fertile fronds not being narrowed; but there are other species in which these fronds are contracted as in *Lomaria*, but in which at the same time the sori are not strictly marginal and the indusium is clearly a development from the under surface and not from the edge of the fronds. These latter, among which the British species is included, ought undoubtedly to be retained in the genus *Blechnum*, the accident of their fronds being contracted alone causing the apparent but unreal resemblance to the structure of *Lomaria*.

Viewed in this light, *Blechnum* includes two sections containing species having some difference of aspect. The § *Eublechnum* represented by the *B. occidentale* of South America, and *B. orientale* of the East, produces the sori close or nearly close to the costa, a considerable space intervening between them and the margin of the frond. The § *Parablechnum*, which includes the British *B. Spicant*, and the South African *B. punctulatum*, has the sori also near the costa, but it becomes submarginal by the contraction of the fronds, and the loss of nearly all the space exterior to the indusium which is so obvious in the other group. There are a considerable number of species of *Blechnum*, and these are dispersed widely both in the Old and New World.

In nearly all the plants having the blechnoid type of fructification, the veins of the fronds are free, that is, distinct at their apices, but there are a few exotic species which present modifications of the reticulated forms of venation. Two of these have been long known, namely *Salpichlæna* in which the venules are combined at the margin, and *Sadleria* in which the veins are arcuately combined near the costa. Another form, the *Blechnum melanopus* of Sir W. J Hooker, a native of the Khasya Hills, has recently been described and figured;* in this the veins are more decidedly reticulated,

* Hooker, *Species Filicum*, iii. 64, t. 161.

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"forming large-angled areoles next the costa, narrower oblique ones often extending to the margin." According to the view we take of the genera of Ferns, these net-veined species require to be separated from those with free veins, and we have accordingly in our *Index Filicum* adopted the name of *Blechnidium* for the net-veined plant above referred to, which thus becomes *Blechnidium melanopus*.

The name of the present genus comes from *blechnon*, a Greek word applied to some kind of Fern.

BRITISH SPECIES AND VARIETIES.

B. Spicant: a perennial with dimorphous pectinate-pinnatifid fronds.

(*a*) *Fronds narrow-lanceolate, or normal in outline.*

var. **lancifolium**: fronds very narrow, almost linear, with short blunt lobes below, entire and caudate in the upper part, the fertile sparingly lobed below, spicate upwards.

var. **subserratum**: fronds narrowish; segments falcately curved forwards, crenately serrate on the posterior side, the anterior margin entire.

var. **imbricatum**: fronds short lanceolate, with crowded densely imbricated segments, the fertile of the same form pinnate, the pinnæ crowded acute; stipites and rachides thick, channelled in front.

var. **strictum**: fronds elongate-lanceolate, with distant subsymmetrical crenately toothed segments, the fertile of the same form or somewhat narrowed with narrow obscurely crenate segments.

(*b*) *Fronds multifid or ramose.*

var. **ramosum**: fronds branched, the apices of the branches densely multifid-crisped forming close obtuse tufts; fertile fronds similar.

var. **multifurcatum**: fronds often divided below, the apices of fronds or branches repeatedly forked, forming a spreading tuft of acutely prolonged segments.

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THE COMMON HARD FERN.

BLECHNUM SPICANT.

B. fronds tufted, dissimilar, linear-lanceolate, coriaceous; the barren spreading or prostrate pectinato-pinnatifid, with approximate oblong linear subfalcate flat segments, often pinnate below, the short rounded segments being there remote; the fertile taller, erect, pinnate, with narrow linear subfalcate acute contracted pinnæ having reflexed margins; sori intramarginal. [Plate XCIV.]

BLECHNUM SPICANT, *Smith, Mem. Acad. Roy. Sc. Turin*, v. 411. *Withering, Arr. Brit. Pl.* iii. 765. *Roth, Cat. Bot.* i. 132; *Id., Fl. Germ.* iii. 44. *Koch, Syn.* 2 ed. 984. *Fries, Sum. Veg.* 83. *Ledebour, Fl. Ross.* iv. 523. *Moore, Handb. Brit. Ferns*, 3 ed. 217; *Id., Ferns of Gt. Brit. Nature Printed*, t. 43 C. *Newman, Hist. Brit. Ferns*, 3 ed. 17. *Bentham, Handb. Brit. Fl.* 635. *Nyman, Syllog. Fl. Eur.* 434.

BLECHNUM BOREALE, *Swartz, Schrad. Journ. Bot.* 1800, ii. 75; *Id., Syn. Fil.* 115. *Smith, Eng. Bot.* xvii. t. 1159; *Id., Eng. Fl.* 2 ed. iv. 303. *Gray, Nat. Arr. Brit. Pl.* ii. 15. *Mackay, Fl. Hib.* 343. *Hooker & Arnott, Brit. Fl.* 7 ed. 590. *Babington, Man. Brit. Bot.* 4 ed. 427. *Sowerby, Ferns of Gt. Brit.* 64, t. 37. *Schkuhr, Krypt. Gew.* 102, t. 110. *Willdenow, Sp. Plant.* v. 408. *Sturm, Fl.* (Farrn.) t. 6. *Mettenius, Fil. Hort. Bot. Lips.* 64, t. 4, fig. 11, 12.

BLECHNUM SPICANS, *Wollaston, Phytol*, n. ser. i. 301; ii. 143, 220.

OSMUNDA SPICANT, *Linnæus, Sp. Plant.* 1522. *Lightfoot, Fl. Scot.* 654. *Bolton, Fil. Brit.* 8, t. 6. *Flora Danica*, t. 99. *Curtis, Fl. Lond.* t. 127. *Poiret, Enc. Supp.* iv. 147, in obs. (*spicans*).

OSMUNDA BOREALIS, *Salisbury, Prod.* 402.

ONOCLEA SPICANT, *Hoffmann, Deutschl. Fl.* ii. 11.

ASPLENIUM SPICANT, *Bernhardi, Schrad. Journ. Bot.* 1801, i. 17.

STRUTHIOPTERIS SPICANT, *Weis, Plant. Crypt.* 287. *Scopoli, Fl. Carn.* ii. 288. *Allioni, Fl. Pedem.* 2390.

ACROSTICHUM SPICANT, *Villars, Hist. Pl. Dauph.* iii. 838. *Sibthorp, Fl. Oxon.* 267.

ACROSTICHUM NEMORALE, *Lamarck, Fl. Franç.* i. 11; *Id., Enc. Bot.* i. 35.

LOMARIA SPICANT, *Desvaux, Berl. Mag.* v. 325; *Id., Prod.* 287. *Sprengel, Syst. Veg.* iv. 62. *Link, Fil. Sp.* 75. *Presl, Tent. Pterid.* 142. *Fée, Gen. Fil.* 68. *Ruprecht, Dist. Crypt. Ross.* 45. *Pappe & Rawson, Syn. Fil. Afr. Aust.* 29. *Newman, Hist. Brit. Ferns*, 2 ed. 89. *Deakin, Florigr. Brit.* iv. 51, fig. 1587. *Lowe, Nat. Hist. Ferns*, iv. t. 52 B. *Hooker, Sp. Fil.* iii. 14.

LOMARIA BOREALIS, *Link, Hort. Reg. Berol.* ii. 80.

STEGANIA BOREALIS, *R. Brown, Prod. Fl. Nov. Holl.* 152, in obs.

SPICANTA BOREALIS, *Presl, Epim. Bot.* 114.

Var. **lancifolium**: sterile fronds narrow (¼ to ½ in.), the upper

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half nearly or quite entire, the rest furnished with short blunt entire or obscurely fine-toothed segments; fertile ones similar in form, spicate ($\frac{1}{8}$ inch wide and undivided) above, sparingly lobed below, the lobes sometimes all much abbreviated.

BLECHNUM SPICANT, *v.* LANCIFOLIUM, *Wollaston MS. Moore, Ferns of Gt. Britain, Nature Printed,* under t. 43 C; *Id., Handb. Brit. Ferns,* 3 ed. 221.

Var. **subserratum**: sterile and fertile fronds narrowish elongate; segments falcately curved forwards, the anterior margin entire, the posterior crenately serrate.

BLECHNUM SPICANT, *v.* SUBSERRATUM, *Moore, in litt.*

Var. **imbricatum**: sterile fronds short lanceolate, with densely crowded overlapping oblong acutish segments; fertile ones of the same size and form, pinnate, their stipites and rachides broad deeply furrowed in front, the pinnæ crowded, acute.

BLECHNUM SPICANT, *v.* IMBRICATUM, *Moore, in litt.* 1858.
BLECHNUM SPICANT, *v.* CRASSICAULE, *McNab, in Hort. Edin.*

Var. **strictum**: sterile fronds elongate lanceolate, sometimes irregular with abbreviated segments; segments distant dilated at the base, crenately toothed; fertile fronds of the same form or sometimes narrower, with distant linear obtuse obscurely crenated segments. [Plate XCV B.]

BLECHNUM SPICANT, *v.* STRICTUM, *Francis, Anal. Brit. Ferns,* 2 ed. 54; 5 ed. 58. *Moore, Ferns of Gt. Britain, Nature Printed,* under t. 43 C; *Id., Handb. Brit. Ferns,* 3 ed. 222.

Var. **ramosum**: fronds divided, the apices of the divisions densely multifid-crisped, forming a close convex terminal tuft of segments. [Plate XCVI A.]

BLECHNUM SPICANT, *v.* RAMOSUM, *Kinahan, in litt.; Id., Phytol.* iv. 892. *Moore, Handb. Brit. Ferns,* 2 ed. 186, 188; 3 ed. 218; *Id., Ferns of Gt. Britain, Nature Printed,* under t. 43 C.

Var. **multifurcatum**: fronds often divided below, the apices of the divisions repeatedly forked, the ultimate divisions acutely prolonged, forming a flat spreading tuft of segments. [Plate XCVII B.]

BLECHNUM SPICANT, *v.* MULTIFURCATUM, *Moore, Ferns of Gt. Britain, Nature Printed,* t. 43 C, fig. 3; *Id., Handb. Brit. Ferns,* 3 ed. 218.

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Caudex stoutish, erect or decumbent, tufted, scaly. *Scales* narrow lanceolate-acuminate, deep tawny brown. *Fibres* stout, numerous, branched, the younger parts densely tomentose.

Vernation circinate.

Stipes of the barren fronds usually short, *i. e.*, one or two inches but sometimes four or five inches long, densely scaly at the base, and with a few narrow scattered scales upwards, dark purplish brown, terminal and adherent to the caudex. *Rachis* channelled in front, rounded and prominent behind. The fertile fronds have longer dark-coloured stipites, from five to ten inches long, and the rachis is distinctly of a dark purple colour.

Fronds of two kinds, sterile and fertile, tufted. *Sterile fronds* from six to eighteen inches averaging about a foot in length, one or two inches in breadth, spreading or prostrate, dark green, hard coriaceous, linear-lanceolate, pectinately-pinnatifid; the *segments* linear-oblong, flat, somewhat falcately curved, dilated and confluent at their base, bluntish or acute at their apex, the margins entire, or rarely when very vigorous obscurely lobed, diminishing both above and below; the lower ones small, roundish, often becoming remote; the upper ones confluent into a lanceolate point. *Fertile fronds* of the same form but taller, one to two feet or sometimes nearly three feet high, growing from the centre of the tuft, erect pinnate below; the *pinnæ* or *segments* linear-acute, contracted to about half the width of the barren segments, the lower ones distant, the upper more contiguous, and there dilated and confluent at the base. Fronds of intermediate character, sparingly fertile, and but partially or not at all contracted, are sometimes produced.

Venation of the segments of the barren fronds distinct, consisting of a stout *costa* or midvein, producing lateral *veins* which are once or twice forked, the *venules* extending parallel towards the margin and terminating in a small club-shaped head. The venation of the fertile fronds is altered in consequence of their contracted nature; it consists of a series of *veins*, which seldom have space to become forked, but are lost in the continuous longitudinal sporangiferous receptacle which runs parallel with and very near to the midvein. In the less contracted fertile fronds, the *venules* are, however, continued towards the margin exterior to the receptacle.

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Fructification on the back of the fertile fronds and occupying nearly the whole under surface. *Sori* indusiate, linear, extending on each side the costa the whole length of the narrow pinnæ or segments, over which they soon become confluent; the *receptacles* continuous, longitudinal. *Indusium* a narrow linear membrane attached along the exterior side of the receptacle, within the margin of the frond, but sometimes from the excessive contraction of the pinnæ almost marginal. *Spore-cases* nearly globose. *Spores* roundish oblong or ovate, slightly angular and punctate.

Duration. The caudex is perennial, and the plant evergreen; the old fronds continuing quite fresh through the winter, and the young ones springing up about May as well as later in the year.

The Hard Fern is a very elegant and distinct-looking plant, and on that account, no less than for its evergreen character, it deserves to be more frequently cultivated. Its long narrow pectinately divided fronds, the barren and fertile growing separate, the former spreading and the latter erect, afford easy marks of recognition, among the indigenous species.

The *Blechnum* is one of our common Ferns, distributed all over the United Kingdom, from the Northern and Western Isles to the south of England, and from the east coast of England to the west of Ireland; occurring also in the Channel Isles. It ranges from the coast-level to an elevation above the sea of nearly 3000 feet in Cumberland, and of 4000 feet in the Highlands of Scotland. Mr. Watson remarks that taking horizontal and vertical range into account, this is probably the most widely-distributed of all our Ferns. It grows in rough heathy and stony places, or in woods or shady hedge bottoms, preferring moisture, and is one of the few Ferns which thrive as well in exposed situations as in shade. Its distribution is general, as the following summary will show:—

Peninsula.—Cornwall: Penryn, *G. Dawson.* Devonshire: Marwood, *Rev. F. Mules;* Barnstaple, *H. F. Dempster.* Somersetshire.

Channel.—Hampshire. Isle of Wight. Dorsetshire. Wiltshire. Sussex.

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Thames.—Hertfordshire. Kent: Tunbridge Wells, *G. B. Wollaston.* Surrey: Mayford, *T. M.;* Portnall Park, Virginia Water. Middlesex: Hampstead Heath, *T. M.* Berkshire: Windsor Forest, *T. Cox.* Oxfordshire. Essex.

Ouse.—Suffolk. Norfolk: St. Faith's Newton near Norwich; Hainsford. Cambridgeshire. Bedfordshire. Northamptonshire.

Severn.—Warwickshire: Acton Park near Birmingham. Gloucestershire: Painswick; Wyck Cliffs, *R. Withers;* Nailsworth, *G. F. Playne.* Monmouthshire: Cwm-Glyn near Pontypool; Newbridge (stipes bifid), *T. H. Thomas.* Herefordshire. Worcestershire: Bromsgrove. Staffordshire. Shropshire.

Trent.—Leicestershire. Rutland. Lincolnshire. Nottinghamshire. Derbyshire.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire: Bradford, *G. W. Jackson;* Castle Howard, *C. Monkman;* Hackfall Woods, *T. Simpson.*

Tyne.—Durham: Teesdale; Tanfield Dean, *T. Wilcke;* Blaydon Burn, *T. W.* Northumberland.

Lakes.—Westmoreland: Ambleside; Ullswater. Cumberland. Lancashire: Conistone (fronds partially fertile), *Miss Beever.*

S. Wales.—Brecknockshire. Glamorganshire. Carmarthenshire. Pembrokeshire: banks of the Tivey, *W. Hutchison.*

N. Wales.—Anglesea. Denbighshire. Flintshire. Merionethshire. Carnarvonshire: Beddgelart.

W. Lowlands.—Dumfries-shire. Kirkcudbrightshire. Renfrewshire. Lanarkshire.

E. Lowlands.—Roxburghshire. Berwickshire. Edinburghshire: Hawthornden, *T. M.*

E. Highlands.—Stirlingshire: Stirling, *Mrs. Macleod.* Clackmannanshire. Fifeshire. Kinross-shire. Perthshire: Pass of the Trosachs. Forfarshire. Inverness-shire: Dunphail, *Miss F. Brown.* Kincardineshire: Kingcausie, *J. T. Syme.* Aberdeenshire: Cairngorm Mountains. Banffshire. Morayshire.

W. Highlands.—W. Inverness-shire. Argyleshire: Ardrishiag, *T. M.* Dumbartonshire: Tarbet, *T. M.* Isles of Arran, Islay, and Cantyre.

N. Highlands.—Ross-shire. Cromarty. Sutherlandshire. Caithness.

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N. Isles.—Orkney. Shetland.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Down: Cloughmore Wood, Rostrevor, *A. Crawford.* Antrim: Colin Glen, Belfast, *A. C.* Tyrone. Monaghan. Cavan. Armagh, *J. R. Kinahan.* Fermanagh: Deer Park near Brookborough, *Rev. W. R. Bailey.* Donegal: Gweedore, *R. Barrington.*

Connaught.—Galway: Connemara; Kylemore, *R. Barrington.* Arran Isles. Mayo: near Eriffe; foot of Sleive More near Dugort, Isle of Achill, *R. Barrington.* Sligo: Lough Gill, *R. B.*

Leinster.—Westmeath. Meath. Louth. Dublin: Three Rock Mountain, *R. Barrington.* Kildare. King's. Queen's. Wicklow: Gt. Sugar Loaf Mountain, *J. R. Kinahan;* near Upper Lough Bray, *R. Barrington;* Tinnahinch, *R. B.* Wexford. Carlow. Kilkenny, *J. R. Kinahan.*

Munster.—Waterford. Tipperary. Clare: Quin Abbey, *J. R. Kinahan;* Lisdoonvarna, *R. Barrington.* Limerick. Cork. Kerry, *W. Andrews.*

Channel Isles.—Jersey. Guernsey, *C. Jackson.*

This Fern is distributed over Europe, extending from Lapland and Sweden in the north, through Lithuania, Holland, Belgium, Germany, Switzerland, France, to Spain and Portugal, Italy, Sicily, and Crete. It grows in the Caucasian provinces of Asiatic Russia, and is found in Kamtschatka and at Sitka. In Africa, it is found in the Azores, Madeira, the Canaries, and Teneriffe; it is reported, on the authority of a specimen in Bory de Saint Vincent's herbarium, to occur at the Cape of Good Hope, and Mr. Newman states that it has been found in Northern Africa. We have also raised this species from fragments of fertile fronds received as a *Blechnum* from Chili, and have little doubt of its being the *Lomaria australis* of Kunze. The *L. Sellowiana* of Presl, from South Brazil, which in our folio edition we had mentioned as another closely allied plant, Sir W. J. Hooker refers to *Lomaria alpina.* According to the same authority, a variety of *Blechnum Spicant* is found in Japan, and another in North-west America, chiefly in the Russian possessions.

This is a beautiful plant for the garden, being of easy manage-

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ment, quite evergreen, and but little liable to suffer injury from frost; while, from the contrast afforded both by the two forms, and the varied aspect assumed by its fronds, it becomes very ornamental. In cultivation it prefers a northern exposure, abundant moisture, and a somewhat retentive soil. For rockwork where these conditions can be fulfilled, it is well adapted. In a cool shady fern house, planted in tolerable sized pots so as to be little liable to fluctuations of moisture at the root, it succeeds very well, planted in a mixture of peat and loam. In a wild state it is found in almost all kinds of soil, but in moist situations. The plants may be increased by division. In transplanting, the old roots should be carefully preserved, with a good mass of soil.

There are many exceedingly curious and interesting varieties of this species now known, differing from the normal condition of the plant in some instances by the abortion or imperfect development of the parts, and in others by an excess of development; some of the latter or crested forms are very beautiful:—

1. *lancifolium* (Woll.). This is the least divided form of the species, and one of the most striking of the varieties yet known. The sterile fronds, which are quite narrow and linear in outline, are when well marked entire and strap-shaped from the apex downwards for one-third or sometimes half their length, the remainder or lower portion being obtusely lobed, with the lobes short, blunt, slightly unequal in length, usually entire, but occasionally obscurely notched with fine teeth; their average length is about five inches, and the breadth of the entire or upper portion about a quarter of an inch, the lobed or lower portion being sometimes equally narrow, sometimes slightly broader. They vary, however, in width from one-eighth to one-half of an inch, diminishing slightly downwards, and rarely attaining a length of eight inches; the lobes are never developed to the full or normal size. The fertile fronds resemble the barren ones in development, the upper portion, in the most characteristic, being entire and spike-like, scarcely notched but usually quite entire along the margins, while in the lower portion a few small short lobes are produced; these few imperfect lobes are about

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an eighth of an inch in length, while the upper spicate portion is at the widest not more than one-eighth of an inch in width, but is often less than this, the sori being here borne in a continuous longitudinal line close to the rachis. The fructiferous fronds, however, sometimes acquire a fuller development of about eleven inches in length, and rather more than half an inch in width, with more numerous lobes below, but still terminating in an entire spicate apex. This variety was found near Tunbridge Wells, Kent, in 1853 by Mr. Wollaston; and the same form has since been found in the valley of the Conway near Llanrwst, and in Staups-Clough near Todmorden, by Mr. Stansfield and Mr. Holmes; who have also sent us the same form from the Clova Mountains in Forfarshire. It proves to be a permanent, and fairly constant form.

2. *caudatum* (M.). This form somewhat approaches *lancifolium*, but is larger and less decidedly spicate at the apex of the frond. The sterile fronds which only are known, are from six to eight inches long, and from three-quarters of an inch to an inch in width, thick and leathery in texture; the apex is confluent or caudate, variable in length, entire or obscurely lobed, the remaining upper portion pinnatifid with unequal linear obtuse segments, about half an inch long, and the basal part one-third or more of the length of the frond, rather suddenly contracted into short rounded lobes. It was found in an old lane at Eastwood, by Mr. Stansfield, of Todmorden, and proves to be quite constant.

3. *brevilobum* (M.). A dwarf form, the fronds three or four inches long, narrow, with short lobes, not much exceeding an eighth of an inch in length, scarcely narrowed below, the upper ones confluent into a broad terminal obtuse lobe; it is only known in the sterile form, and requires proving. It was found by Mr. Stansfield, in a ravine above Acre Mill, Rosendale.

Mr. Stansfield mentions a var. *gracilis*, as being smaller than the normal plant, less common, very slender, the lobes distant and slightly contracted. It was found among millstone-grit rocks in the upper part of Harleywood-Slack, and appears likely to be permanent.

4. *anomalum* (M.). This form is remarkable for its thin and herbaceous texture, and its lax habit. The fronds are of nearly uniform character, and indifferently fructiferous, from six to ten or twelve

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inches long, arching, furnished with narrow linear subfalcate segments. In some fronds the upper pinnules alone become fertile, and the lower remain sterile, in others less perfectly developed a few scattered oblong sori are produced here and there, the distinction between barren and fertile fronds presented by the species in its normal state being lost. The sori are sometimes continuous as in the normal plant, sometimes oblong, separated though in contiguous lines, and sometimes oblong and scattered. Somewhat similar semifertile fronds are occasionally borne on the normal form, but this appears to be a permanent variety of less than the average size. We have received it from Lancashire: Walsden, *A. Stansfield;* Peck Hill, *R. Morris.* Ross-shire: mountain stream near Loch Alsh, *Miss Mahy.*

— *anomalum minus* (M.). This is a smaller form of the same general character as *anomalum;* the fronds being about four inches high, and proportionately narrow. It was found on Walsden Moor, by Mr. Stansfield, who states that growing "cozily in the green sphagnum, almost in the water, and surrounded by other common *Blechnums*, it seemed a fairy form among satyrs." A frond which appears to be of the same form, gathered in Carnarvonshire, at Beddgelart, has been sent us by Mr. F. C. Wilson.

5. *angustifrons* (M.). The fronds of this form, of which we have only the sterile state, are lax, and otherwise thinner than usual in texture, about ten inches long, swelling out to about an inch in breadth in the middle, and tapering off in both directions so as to acquire a long narrow outline. It was found in the Vale of Todmorden, by Mr. Stansfield.

6. *imbricatum* (M.). A beautiful and remarkably distinct constant variety, of which two or three forms occur. In the best form we have seen, the fronds are about five or six inches broad, lanceolate, tapered below, upwards of an inch in width, the segments oblong acutish, densely crowded and overlying in an imbricated manner. The fertile fronds are about the same size and form, but elevated on somewhat longer stalks, so that they are six or seven inches high; they are pinnate, with crowded acute segments. The dense sterile fronds are erectish and stand out around the crown forming a hollow centre. The stipites and rachides, espe-

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cially of the fertile fronds, are unusually thick, and deeply channelled in front. The plants have quite an exotic character, and the fertile fronds have been not inaptly compared to those of *Lomaria nuda*. The plant above described was found at Parracombe, in Devonshire, and at Culborne, by Mr. J. Dodds. Others have been obtained in Devonshire: Barnstaple, *C. Jackson*. Somersetshire: Nettlecombe, *C. Elworthy* (longer and rather less dense). Lancashire: Walsden, near Todmorden, *J. Horsfall;* Staups Valley, Todmorden, *A. Stansfield*. Staffordshire: Lichfield, *J. Young*. Pembrokeshire: near Castle Malgwyn, *W. Hutchison*. Perthshire: Glen Almond, *J. McNab*. One of the slightly varying forms has been called *crassicaule*, but, at least until these have been thoroughly tested, it seems best to consider them as variations of one variety.

7. *parvulum* (M.). A remarkably neat form, having fronds four to six inches high (sterile), and scarcely half an inch wide in the broadest part, much tapered at the base; the segments small, crowded and overlapping, nearly ovate in the upper part of the frond, rounded towards its base. It has been sent from—Devonshire: Barnstaple, *C. Jackson*. Lancashire: Todmorden, *A. Stansfield*.

8. *strictum* (Francis). This elegant and permanent variety has the sterile fronds lanceolate, narrowed more towards the base than the apex, six to eight inches long, or sometimes more, the segments rather distant, linear obtuse, dilated at the base, the lower ones shorter and rounded, and the margins throughout crenate-toothed in a somewhat uneven and irregular manner. When well developed, the fronds are tolerably symmetrical, the slight differences occurring in the width and length of the segments, not affecting the general outline; but they are sometimes more irregular, and occasionally a good deal interrupted, with short rounded segments among the longer ones, as in the sketch originally published by Mr. Francis. The margins of the segments are recurved, and often somewhat crispy. The fertile fronds are of the same outline, but taller, a foot to a foot and a half in height, with very narrow obtuse distinct linear segments, dilated at the base, and obscurely crenate on the margin. Sometimes the fertile fronds are much narrowed

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from the shortening of the segments, and the apex becomes almost caudate. This variety was first noticed by Mr. Francis, from Westmoreland fronds communicated by Miss Beever. It has been found more recently by Mr. F. Clowes, near Bleak Holme, Windermere, and the plants in cultivation from this source prove very constant and beautiful; by Dr. Allchin, in Ireland; by Mr. A. Stansfield, near Greenhursthey in the Vale of Todmorden, and by the same gentleman, in company with Mr. Holmes, in the valley of the Conway, near Llanrwst. It also appears to have been found a few years since near Halifax. [Plate XCV B.]

9. *concinnum* (M.). A neat and elegant form. The fronds are six to nine inches long, irregular in growth, the lower part linear with rounded segments toothed at the ends, while in the upper part the segments are longer, but unequal in length, sometimes obtuse, sometimes acute, here and there interrupted by the occurrence of short rounded lobes like the basal ones; the lobes appear to be all toothed. The fertile fronds are much depauperated, the lower segments, though soriferous, being scarcely at all developed, but forming two narrow sinuous wings close to the rachis; in the upper part the lobes are rather more developed, but the longest are scarcely one-fourth of an inch in length. It was found by Mr. Holmes and Mr. Stansfield, among the hills skirting the valley of the Conway, in North Wales, and has been communicated by Messrs. Stansfield. What we take for the same form has been sent from—Devonshire: Marwood, *Rev. F. Mules;* Barnstaple, *C. Jackson.*

10. *heterophyllum* (Woll.). This variety, which is an interesting and curious form, bears each season two sorts of sterile fronds, either separately or together; part of them being of the usual or normal character, while others have the parts more or less altered in size and form. In these latter fronds the segments become either narrowed and inciso-dentate, or shortened to a semicircular form, with the margin inciso-dentate; this occurs in an unequal and irregular manner, though it frequently occurs that continuous portions of the fronds, sometimes entire fronds, bear the shortened segments, and are consequently linear in outline; usually, however, these abnormal fronds are interruptedly linear, that is quite

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narrowed in portions of their length, and having longer projecting segments occurring at irregular intervals. The fertile fronds are correspondent in character, being sometimes nearly or quite normal, and sometimes interruptedly abbreviated in the segments. As in many other varieties of monstrous character, the plants, though not having all the fronds affected, nevertheless constantly produce affected fronds. It was found near Tunbridge Wells, Kent, in 1853, by Mr. Wollaston. Similar forms have been found at Todmorden, by Mr. T. Stansfield, and at Ilfracombe, by Mr. J. Dodds. [Plate XCV A.—Folio ed. t. XLIII C, fig. 2.]

11. *ramo-depauperatum* (Stansf.). The sterile fronds of this variety are linear below, with short rounded toothed segments, and interrupted above, some of the segments being short and rounded, and others unequally elongated, the apex being dilated. In this state it resembles *concinnum*, except in the tendency to become forked at the tip. It is, however, described by Messrs. Stansfield, of Todmorden, as being usually but variously forked and branched, and when in this state must be an elegant form. It was found in the Clova Mountains in Forfarshire, by Mr. J. Horsfall.

12. *projectum* (M.). The sterile fronds of this form are very narrowly linear lanceolate, the base and apex being tapered off, and the centre portion less than half an inch in width, the lobes throughout with a few exceptions being bluntly rounded: these exceptions consist of a lobe or segment here and there developed into the usual linear-oblong obtuse form; thus the fronds appear to be symmetrically narrowed, but with a few prominent lobes projecting beyond this narrowed outline; quite different, however, from the irregular narrowing which occurs in *heterophyllum* (10), and *concinnum* (9). It is reported to be constant, but only sterile fronds are known. It is stated to have been found in the neighbourhood of Ben Lawers, in the Scottish Highlands, and was communicated by Messrs. Stansfield of Todmorden.

13. *interruptum* (Woll.). This variety is variable in its growth. Some of its fronds are multifid or irregularly ramose towards the apex; others are normal in their general outline, but with the segments here and there depauperated, and occasionally they are unilateral near the top with the rachis bent down at the apex in a

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hook-like form; others of intermediate semi-fertile character are produced with the lobes furcate at the tips, but all are more or less interrupted, and where an abortion of the lobes occurs, the rachis is generally more or less laterally curved. The perfect lobes are acute, and not unfrequently enlarged beyond the normal size. It was found near Tunbridge Wells, Kent, by Mr. Wollaston, and is a permanent form. A somewhat similar form, having fronds of interrupted or irregular growth, with acute segments, has been found at Castle Howard, Yorkshire, by Mr. C. Monkman, but it requires proving.

14. *inæquale* (M.). This form resembles *interruptum* (13), in being of irregular growth, with acute segments, but so far as is known, it is of the normal lanceolate outline, only irregular along the edges from the unequal length of the segments; there are a few short segments at the base. It was found near Todmorden by Messrs. Stansfield.

15. *erosum* (M.). A small form, about three inches high, with fronds of irregular lanceolate outline, the margins of the various shaped segments erose, as if nibbled. It appears likely to be an interesting and permanent form, but requires proving. The plants were found in the Vale of Todmorden by Mr. Stansfield.

16. *latipes* (M.). The sterile fronds we have seen of this form are about six inches long, and an inch and a quarter broad, of nearly equal width throughout, the segments not diminishing towards the base but rather longer there; this peculiarity is less marked in the semi-fertile fronds, but they terminate abruptly below. It was found in Ramsden Valley, and in Cat-holes-Clough in the neighbourhood of Todmorden, by Mr. Stansfield. It had been proposed to call this *asplenioides*, on account of the short broken up sori, but this may prove a mere accidental condition.

The name *sinuatum* has been suggested for another form found in Staups-Clough, Todmorden, by Mr. Stansfield. In this the margins of the lobes are sinuated, but it may prove to be a semi-fertile accidental variation of the normal state, as the only sterile fronds we have seen bear the longitudinal vein which is characteristic of the usual fertile fronds of this species.

17. *brevifrons* (M.). A dwarf, but broad-lobed form. The

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fronds are four or five inches long, nearly or quite an inch broad, lance-shaped with the lower segments shorter, but terminating abruptly and without the long diminishing base which is usual in the species: thus only about a single pair of lobes are semi-rotund, the rest being ovate and then oblong. The sterile fronds only are known. It was found by Mr. Stansfield in the Vale of Todmorden. It has somewhat the outline and aspect of *Lomaria alpina*.

18. *latifrons* (M.). The sterile fronds of this large-growing form resemble those of *Lomaria lanceolata*; they are about six inches long, and an inch and a half broad, lanceolate, narrowing rapidly to the base, the segments crowded, the longer ones broad-linear, somewhat falcate, and having a short acute point. The fronds are moderately thick in texture. It has been found by Mr. Stansfield, of Todmorden, at Eastwood, Pennant-Clough, and elsewhere, and by Mr. Nowell and Mr. Patman, in Mytholm Valley.

19. *majus* (M.). In this, of which fragments only have reached us, the segments are two inches long, dilated at the base, and tapered towards the acute apex. It is an unusually large form; and was found by Mr. Elworthy, near Nettlecombe, Somersetshire.

20. *abruptum* (M.). This form appears permanent. The fronds are developed in a normal manner, to about half the usual length, at which point the rachis stops short, the apex consisting of one or two segments set on endwise. The plant was found about Todmorden, and communicated by Mr. Stansfield.

21. *subserratum* (M.). This is a very elegant and a permanent form. The fronds are narrowish, six inches to a foot in length, the shorter about three-fourths of an inch, and the latter an inch and a quarter broad, sometimes almost linear in outline, the base being often scarcely narrowed, but sometimes more or less tapered below; the fronds are usually curved in a lateral direction, and the acute segments are remarkably curved forwards in a falcate manner, so much so as to overlie each other; the anterior margin of these segments is entire, while the posterior margin is notched with conspicuous shallow rounded lobes or crenatures. The fertile fronds have precisely the same deorsely-crenate character. This variety was found near Malton, Yorkshire, by Mr. C. Monkman, and has been

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communicated by that gentleman, and Mr. Clapham. It has also been found at Cat-holes-Clough, Todmorden, by Mr. Stansfield.

22. *serratum* (Woll.). This is a vigorous form and somewhat variable. In the original plant, the barren fronds, often a foot in length, are more or less deeply serrated, and frequently forked at the tips. The fertile ones, as usual, are taller, broad lanceolate in outline, often three inches wide in the centre, with the lobes sharply serrated, and sometimes forked at the tips, the fronds themselves being also sometimes forked. In this form semi-fertile fronds without serratures are sometimes produced. This was found in 1853 by Mr. Wollaston near Tunbridge Wells, Kent, in a boggy ditch, and has since proved tolerably constant. In other forms the sterile fronds are more decidedly and coarsely serrated in a variable degree. The plant has been found in—Devonshire: Ottery St. Mary, *G. B. Wollaston;* Barnstaple, *C. Jackson.* Durham: Tanfield Dean, *T. Wilcke.* Lancashire: Todmorden, *J. Fielden.*

23. *tridactylum* (M.). A curious dwarf form three or four inches high, the fronds coriaceous, nearly normal in character below, furnished with shortish blunt lobes throughout, except at the apex which, in a portion of the fronds, is remarkable for being developed into about three much larger segments, which not unfrequently are placed so as to resemble three spreading claws or fingers. Some of the fronds are entire or slightly caudate at the apex. The fertile fronds are not known; but the sterile ones prove constant. It has been found in Towerclough near Portsmouth, by Mr. S. Nowell; and was communicated by Mr. Stansfield.

24. *trinervium* (Woll.). This very remarkable variety may be described as a trifoliated *Blechnum.* In its most usual condition, its fronds resemble those of the normal form, except that they are less tapered or diminished below, and at the base produce two lateral branches resembling small fronds. The fertile fronds have the same character. Both forms of frond are however occasionally produced with their apices forked; the lateral branches are also occasionally forked, and in some instances, the lower part of the central branch in the fertile fronds, has the segments irregularly and distantly placed, as well as enlarged and pinnatifidly lobed, or sometimes forked. The segments of the sterile fronds are also

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occasionally somewhat crisped. This rare and very peculiar variety was found in 1854, by Dr. Kinahan, on the Sugar-loaf Mountains in Wicklow, Ireland. [Plate XCVI B.]

25. *dentigerum* (M.). An elegant and constant form, of vigorous growth, the sterile fronds being eight inches to a foot long, and an inch and a half wide, gradually narrowed below, and forked at the tips; the segments are acute, and especially in the lower half of the fronds, much toothed in a very unequal manner, producing the appearance of being irregularly serrated. The fertile fronds are forked once or twice toward the tips, and the segments are occasionally forked. It was found in the neighbourhood of Windermere by Mr. F. Clowes.

26. *fissum* (M.). The peculiarity of this vigorous form is, that the apex of the rachis is, as it were, split down a few inches, both sides of the resulting branches bearing lobes, but those on the inner sides are rudimentary, or very much smaller than those of the outer sides; the apices are occasionally somewhat multifid. The appearance produced by the inequality of development in the lobes of the branches, is similar to that of some kinds of *Gleichenia*. It has been found near Tunbridge Wells, and also near Todmorden; and is tolerably constant.

27. *bifidum* (Woll.). In this which is a vigorous subpermanent form, not uncommon, the tips of the segments are more or less uniformly forked in a bifid or trifid manner, as in the var. *bifidum* of *Polypodium vulgare*. The apex of the frond is also sometimes multifid. The lobes, both of the fertile and barren fronds, are affected, but not uniformly. It has been gathered in—Durham: Blaydon Burn, *T. Wilcke*. Yorkshire, *A. Clapham*. Kent: Tunbridge Wells, *G. B. Wollaston*. Devonshire: Barnstaple, *C. Jackson*.

28. *multifidum* (Woll.). This variety differs from the normal form in being once or more divided at the apex, but neither uniformly nor symmetrically. Such forms are of frequent occurrence, in damp shady places, and many of them are not constant under cultivation, so that they require proving. It has been found in—Kent: Tunbridge Wells, *G. B. Wollaston* (2 forms); Chislehurst, *G. B. W.* Devonshire: Ilfracombe, *J. Dodds;* Marwood, *Rev. F. Mules*. Somersetshire: Nettlecombe, *C. Elworthy*. Lancashire: Peck Hill, *R.*

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Morris. Yorkshire: Malton, *C. Monkman.* Monmouthshire: Crumlin, *T. H. Thomas.* Denbighshire: Ruthin, *T. Pritchard.* Inverness-shire: side of Loch Moidart, *Rev. T. F. Ravenshaw.* Clare: Quin Abbey, *J. R. Kinahan.* [Plate XCVII A.]

29. *crispum* (Woll.). This is an uncommon but permanent and elegant form. The sterile fronds are eight to ten inches long, nearly normal in outline, but their apices are multifid-crisped, forming a small terminal slightly curly tassel with rounded or blunt-ended divisions; the lateral segments are crowded, more or less wavy or curled on the margin and obtuse, but very rarely divided at the point. The fertile fronds are of the same character, the apex forming a small obtuse crispy dilatation, and the ends of the narrow lateral segments being obtuse. This form was found in 1851, in Broadwater Forest, Tunbridge Wells, Kent, by Mr. Wollaston.

30. *crispum auritum* (M.). This subform has the segments of the sterile fronds wavy or curled as in *crispum*, but the fronds want the small blunt terminal crest. The fertile fronds are dilated or multifid at the tips, and their segments are aurite at the base, serrate on the margin, and acute or in some fronds freely forked at their apex; the aurite character is very marked at the anterior base of the segments. This was found in Ireland by Dr. Kinahan.

31. *crispatum* (M.). A small form allied to *crispum* (29), having the segments crispy, but apparently simple at the apex. It has been found near Barnstaple by Mr. C. Jackson; and near Todmorden by Mr. A. Stansfield.

32. *cristatum* (Woll.). This constant and beautiful form is somewhat variable in its development. It is of moderately vigorous habit, the fertile fronds growing about a foot in height and the sterile from six to eight inches. The fronds are nearly normal at the base, and of a general lanceolate outline, but the apex is very variable: sometimes it is slightly divided and dilated, its lobes and those towards the top of the frond being broader than the rest and with a tendency to dilatation at their tips. The fertile fronds corresponding to these have many of the segments forked. At other times the segments are not forked, but the apex of the frond becomes branched into a larger multifid head, of which the parts are broader than in the rest of the frond. It sometimes takes a more irregular

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growth, being ramose, and to some extent interrupted in the development of the lobes. The obvious peculiarity of this variety is the development of the extremities either of the frond or of the segments, into a broader and more dilated form than the parts beneath them. The plant has a tendency to throw up semi-fertile fronds, the lobes of which are sometimes bifid, and sharply serrated. It was found in 1853, near Tunbridge Wells, by Mr. Wollaston.

33. *multifurcatum* (M.). This is a handsome and vigorous variety, very irregular in its form, but quite constant to its peculiarities. These peculiarities consist, (1), in the occasional branching of the fronds once or twice near the base; and (2), in the apices of the fronds which are not so branched, as well as the branches of the former, being many times forked near the apex so as to form a moderate sized flat tuft. The segments resulting from these apical furcations are quite irregular in form and size, but they spread out, and are most of them extended into a lengthened acute point, of which the margins are irregularly notched, producing a somewhat ragged appearance. The fronds are about six to eight inches long, tapered below, and sometimes producing a pair of lateral branches at the base as in *trinervium* (24); the segments are often of unequal length, broadish, acute. The fertile fronds are unknown to us. It was found in 1853, in a hedge-bank near Penryn, Cornwall, by Mr. F. Symons, and was communicated by Mr. G. Dawson. Mr. Stansfield states that he has found the same variety near Over Darwen, Lancashire. [Plate XCVII B.—Folio ed. t. XLIII C, fig. 3.]

34. *ramosum* (Kin.). This variety, which is exactly analogous to *Scolopendrium vulgare*, var. *ramosum*, is one of the most beautiful yet discovered. The rachis (or, very rarely the stipes) both of the fertile and barren fronds divides dichotomously into a series of crowded branches and branchlets, the apices of which are beautifully curled forming dense blunt-ended tufts. The variety has been found in Ireland, near Upper Lough Bray, in Wicklow, by Dr. Kinahan; and between Ashleagh and Eriffe, in Mayo, by Captain Morton Eden; also in England in Furness Fells, Windermere, Westmoreland, by Mr. J. Huddart: the three plants differing very slightly. [Plate XCVI A.]

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Genus XI: **PTERIS**, *Linnæus.*

Gen. Char.—**Sori** indusiate, marginal, linear, continuous or interrupted; the **receptacles** linear transverse uniting the apices of the veins in the fertile fronds. **Indusium** of the same form, membranaceous [double in *P. aquilina*]. **Veins** simple or forked from a central costa; **venules** free.

Fronds varying from pedate to decompound, often of large size, herbaceous or coriaceous.

Caudex short erect, or creeping, sometimes much elongated and subterraneous.

This extensive and varied group is known among the linear-fruited indusiate genera by having its sori marginal, and at the same time removed from the costa. In *Lomaria*, which has already been mentioned in contrast to *Blechnum*, the marginal sori are coincidently costal in consequence of the contraction of the fronds; but in *Pteris* where they are also quite marginal, the fronds are not much if at all contracted, so that they appear distant from the costa. In other technical characters, *e. g.*, in their free veins, and strictly marginal indusia, these genera have a close resemblance, though they are in reality sufficiently and readily distinguishable from each other.

The genus *Pteris* has been divided into two sectional groups. Of these, § *Eupteris*, containing the well-known garden *P. longifolia* and *P. crenata*, and embracing the majority of the species, is known by having its vernation terminal, that is the young fronds are always developed from the extremity or apex of the caudex. The § *Ornithopteris* has the vernation lateral: in other words, the young fronds spring up from a point behind the apex or growing point of the caudex, or at least the caudex elongates so rapidly that the fronds become outstripped in their development; this latter group is represented by the common *P. aquilina* and its allies.

This *Ornithopteris* section of the genus appears to be also marked by another peculiarity, namely by the presence of a second or inner

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so-called indusium, which is either not constantly produced or is sometimes not easily found. This inner membrane lies next the surface of the frond beneath the spore cases, which latter are covered by the evident reflexed indusiform margin. We believe when better understood this will be found to indicate a structure quite analogous to that of the *Lindsææ*, the spore-cases lying in a continuous line, between an inner and an outer indusium, the latter of which is formed from the attenuated margin; differing from *Lindsææ* in little beyond the fact of the sori being deflected so as to come in contact with the under surface of the frond. If this should prove to be the case, it is evident that this group of *Pteris* must be separated from the other larger group in which no inner indusium is found. It would in this case be most convenient as involving the fewest changes in nomenclature to distinguish the *Ornithopteris* or smaller group by some other name, leaving the *Eupteris* or larger group under the present name of *Pteris*. There is good reason to conclude that the structure which occurs in this case is the same as that of the long doubtful genus *Pæsia* of St. Hilaire, and if it becomes necessary to carry out the separation already hinted at, *Pæsia* has the strongest claim to receive the species requiring to be removed. For the present, however, our British plant may be left in the position it has occupied since the time of Linnæus.

There are various netted-veined species having pteroid fructification, which have been removed to other genera, by far the larger proportion of these being included in *Litobrochia*. Even when thus reduced to the free-veined species having the pteroid fructification, *Pteris* forms an extensive and widely dispersed family.

The name is the Greek *pteris*, which was applied to some kind of fern; it is derived from *pteron*, a wing or feather, and was no doubt used in allusion to the plumy or feathery character of the plants to which it was originally applied.

BRITISH SPECIES.

P. aquilina: a perennial, with tall bi-tri-pinnate fronds, from a subterraneous creeping caudex.

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THE COMMON BRAKES, or BRACKEN.

PTERIS AQUILINA.

P. fronds large, coriaceous, bi-tri-pinnate, pubescent beneath; primary pinnæ sub-opposite, in pairs; ultimate divisions (pinnulets) sessile, entire or pinnatifid, the terminal one often longer; indusium double, ciliated, the inner one sometimes obsolete; caudex creeping, subterraneous. [Plate XCVIII.]

PTERIS AQUILINA, *Linnæus, Sp. Plant.* 1533. *Bolton, Fil. Brit.* 16, t. 10, (bad). *Smith, Eng. Bot.* xxiv. t. 1679; *Id., Eng. Fl.* 2 ed. iv. 305. *Hooker & Arnott, Brit. Fl.* 7 ed. 590. *Mackay, Fl. Hib.* 343. *Babington, Man. Brit. Bot.* 4 ed. 427. *Deakin, Florigr. Brit.* iv. 54, fig. 1588. *Newman, Hist. Brit. Ferns,* 2 ed. 93. *Moore, Handb. Brit. Ferns,* 3 ed. 223; *Id., Ferns of Gt. Brit. Nature Printed,* t. 44. *Sowerby, Ferns of Gt. Brit.* 67, t. 38. *Bentham, Handb. Brit. Fl.* 635. *Hooker, Sp. Fil.* ii. 196 (excl. δ.); iii. t. 141 A (indusium). *Swartz, Syn. Fil.* 100. *Schkuhr, Krypt. Gew.* 87, tt. 95, 96. *Willdenow, Sp. Plant.* v. 402. *Sprengel, Syst. Veg.* iv. 78. *Koch, Syn.* 2 ed. 984. *Fries, Sum. Veg.* 330. *Ledebour, Fl. Ross.* iv. 524. *Sturm, Fl.* (Farrn.) t. 9. *Svensk Bot.* t. 90. *Flora Dan.* t. 2303. *Agardh, Recens. Sp. Pter.* 49. *Fée, Gen. Fil.* 126, t. 11 A, fig. 3 (stipes). *Mettenius, Fil. Hort. Bot. Lips.* 59; *Id., Pter.* t. 16 fig. 13-15. *Lowe, Nat. Hist. Ferns,* iv. t. 3. *Nyman, Syll. Fl. Eur.* 433.

PTERIS BOREALIS, *Salisbury, Prod.* 402.

PTERIS FŒMINA, *Gray, Nat. Arr. Brit. Pl.* ii. 16.

PTERIS CAUDATA, *Link, Enum. Plant. alt.* ii. 464 (excl. syn.); according to Link.

PTERIS BREVIPES, *Tausch, Flora,* (Regens. Bot. Zeit.) xix. 427; *Id.,* xx. 351.

PTERIS NUDICAULIS, *Güldenstadt, Itin.* i. 421; according to Ledebour.

PTERIS RECURVATA, *Wallich, Cat.* 113. *Agardh, Recens. Sp. Pter.* 50.

PTERIS EXCELSA, *Blume, Enum. Plant. Jav.* 213.

PTERIS FIRMA, *Wallich, Cat.* 100.

PTERIS TERMINALIS, *Wallich, Cat.* 101.

PTERIS WIGHTIANA, *Wallich, Cat.* 2178.

PTERIS LANUGINOSA, *Bory MS. Willdenow, Sp. Plant.* v. 403. *Sprengel, Syst. Veg.* iv. 78. *Kaulfuss, Enum. Fil.* 189. *Link, Enum. Plant. alt.* ii. 464. *Agardh, Recens. Sp. Pter.* 51. (incl. β.). *Fée, Gen. Fil.* 126.

PTERIS DENSA, *Wallich, Cat.* 99.

PTERIS DECOMPOSITA, *Gaudichaud, Frey. Voy.* 393; according to Hooker.

PTERIS REVOLUTA, *Blume, Enum. Fil. Jav.* 214. *Agardh, Recens. Sp. Pter.* 53.

PTERIS VILLOSA, *Fée, Gen. Fil.* 126, 128 (excl. the reference to Cuming 408, which is *Cheilanthes tenuifolia*).

PTERIS CAPENSIS, *Thunberg, Prod.* 172. *Willdenow, Sp. Plant.* v. 393. *Schlechtendal, Adumb. Plant.* 45, t. 26. *Agardh, Recens. Sp. Pter.* 51.

ALLOSORUS AQUILINUS, *Presl, Tent. Pterid.* 153. *Pappe & Rawson, Syn. Fil. Afr. Aust.* 32.

ALLOSORUS TAURICUS, *Presl, Tent. Pterid.* 154, according to Ledebour.

ALLOSORUS RECURVATUS, *Presl, Tent. Pterid.* 154.

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ALLOSORUS LANUGINOSUS, *Presl, Tent. Pterid.* 154.
ALLOSORUS CAPENSIS, *Pappe et Rawson, Syn. Fil. Afr. Aust.* 32.
ALLOSORUS VILLOSUS, *Presl, Tent. Pterid.* 154.
ALLOSORUS HOTTENTOTTUS, *Presl, Tent. Pterid.* 154.
CINCINALIS AQUILINA, *Gleditsch, Diss.* i. 24.
ASPLENIUM AQUILINUM, *Bernhardi, Schrad. Journ. Bot.* 1799, i. 310.
EUPTERIS AQUILINA, *Newman, Phytol.* ii. 278; *Id.*, 1851, *App.* iii.; *Id.*, *Hist. Brit. Ferns*, 3 ed. 23.
PTESIA AQUILINA, *Moore, Gard. Chron.* 1858, 878.

Caudex as thick as one's little finger, subterraneous, creeping extensively, black and somewhat velvety on the outside, white succulent and starchy within. *Fibres* branched, downy.

Vernation circinate; the rachis in an early stage is bent down abruptly close against the stipes.

Stipes lateral, distant on the caudex and adherent to it, spindle-shaped, black and velvety at the base, *i. e.*, beneath the ground surface, yellowish green above, pubescent while young, afterwards smooth, roundish or semiterete, but with two sharp cutting angles, often about half the length of the frond. A transverse section cut at various angles shows the ends of the vascular bundles arranged so as to present different fanciful resemblances to the imperial or spread eagle, whence the specific name. *Rachis* channelled above, rounded behind, sometimes slightly asperulous.

Fronds variable in size, outline and composition, deep green, of a harsh rigid texture. In poor soils they grow from six to eighteen inches in height, and in more favourable localities they reach from three or four feet which is an average size, to eight ten or twelve feet, or even more in some cases. When dwarfed their outline is nearly triangular, and the lower pair of branches only being well developed, they appear three-branched though not truly so. When more vigorous they become elongated or oblong, and consist of a series of branches successively developed, in pairs, one above the other. The smaller fronds are bipinnate, the larger tripinnate. *Primary pinnæ* or *branches* ovate or oblong-ovate, opposite or subopposite, often distant. *Pinnules* or *secondary pinnæ* narrow lanceolate or narrowing from a broad base, opposite or alternate, contiguous, bluntish or sometimes caudate. *Pinnulets* or ultimate distinct divisions sessile, smooth above, hairy beneath, blunt at the apex; oblong

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entire or sinuate and adnate by their whole breadth, or more ovate pinnatifid and then with a narrower attachment and furnished with blunt linear oblong or shorter triangular lobes. In seedling plants or those grown in caves or in fissures of rocks or on walls, the fronds are peculiarly tender and delicate with an entirely different aspect. The same occurs when they spring up, as they sometimes do, accidentally in hothouses.

Venation of the more entire pinnulets, consisting of a stoutish *costa* or midvein, from which the forked *veins* branch out in a curving or arcuate manner; these veins are one, two or three times forked, the *venules* extending to the margin. In the pinnatifid pinnulets the veins become secondary midveins to the lobes, and give off a series of once or twice forked veins; in these latter the lowest branches right and left of the secondary midveins sometimes meet and unite to form a series of costal areoles. The edges of the fertile pinnulets produce a longitudinal submarginal vein, which becomes the receptacle.

Fructification abundant on the back of the fronds. *Sori* linear, continuous, indusiate, marginal, the receptacle occupying nearly the margin of the pinnulets, and lying as it were in the axil of the indusium. *Indusium* linear, continuous, double, consisting of an outer and inner membrane, the former growing from the outer edge of the receptacle, thin, whitish, fringed, and folded inwards over the spore-cases, the latter growing from the inner edge of the receptacle, also thin, whitish, fringed, and lying beneath the spore-cases, the fructiferous margin being deflected so as to come in close contact with the under surface; the fringes of these membranes, of which the inner is sometimes obsolete, consist of small jointed hairs.. *Spore-cases* roundish obovate. *Spores* round oblong or angular, muriculate.

Duration. The rhizome is perennial. The fronds are annual, growing up early in May, but they are very impatient of cold, being often cut down by late spring frosts and they are sered and killed by the early frosts of autumn, though from their rigid texture they retain their form through the winter.

A common and well-known Fern, easily recognised technically

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among the British Ferns, by the continuous lines of marginal sori, produced on compound fronds which are not contracted. It is the *Filix fœmina* of the older writers, though not of Linnæus. Like all other widely diffused species it is subject to variation in outline and division, as well as in vestiture, but the variations are of little importance.

The nature of the membrane which is found lying beneath the sori, in the fully fructified fronds, and which we have called an inner indusium, has at various times received the attention of botanists; but with little result as to its actual value in a systematic point of view. It appears to have been first made known by the late Mr. T. Smith, in a letter communicated to Sir W. J. Hooker, in 1819, and published in the *Flora Scotica*, (p. 2, 156). Mr. Smith regarded this inner membrane as the true indusium or involucre. He describes it as being formed exactly opposite to that which is seen on the edge of the frond, the line of capsules or spore-cases being placed between the two. "It may be called the inner involucre, and much resembles the outer, having like that a ciliated edge, but instead of being flat it curls inwards covering the capsules in their young state, and being itself covered by the outer one; it is best perhaps seen when the capsules are about half ripe, at which time it is nearly the same breadth as the outer one, and is readily seen by the assistance of a microscope. I have found it," he continues, "in *P. caudata*, which is very nearly allied to *aquilina;* it also occurs in *P. esculenta*, and our mutual friend Brown authorises me to say, that it is found in a small group of the genus *Pteris*, the species of which agree in habit, and are mostly extra-tropical." Sir J. E. Smith has recorded the same structure; and Mr. Newman subsequently described it with illustrative figures. More recently Mr. W. Wilson has published some excellent drawings* of the double indusium found in *P. aquilina, esculenta*, and *scalaris*. It would seem that the lines of spore-cases lie between two membranes naturally projected outwards from the receptacle, which structure does not very widely differ from that which occurs among the *Lindsææ;* but in this case the revolution of the margin brings the smaller or inner of these membranes into contact with the under

* Hooker, *Species Filicum*, iii. t. 141.

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surface of the frond, while the other membrane lies over the sporecases as if it were simply a recurved margin. The former we are inclined to regard as a true indusium, while the latter is probably of the nature of an accessory indusium, such as occurs in the *Dicksonieæ*, only there the fructification is broken up into short or punctiform sori. We have elsewhere pointed out* that this structure appears to be the same as that which occurs in the long doubtful genus *Pæsia;* the plant on which the latter genus was founded being, we believe, the *Pteris scalaris* of recent authors, in which short subrotund sori occasioned by the breaking up of the margin into smaller lobes, occur in company with others of the more usual elongated pteroid form. The name *Pæsia* consequently has the priority, if it is ultimately found necessary to remove these plants from the other species of *Pteris;* in which case the genus would constitute a § *Pæsæ* of the *Polypodiaceæ* in the neighbourhood of the *Lindsææ*.

The Bracken is the most abundant of our wild Ferns, occurring in woods, thickets, heaths, and waste places, apparently avoiding a chalky soil: this latter circumstance however, according to Mr. C. Johnston, being rather due to the ordinary shallowness of the soil over that rock, than to any prejudicial influence in the chalk itself. It is spread over Great Britain, from Cornwall to Shetland, the Orkneys, and the Hebridean Islands of North Uist, Harris, and Lewis; and is plentiful also in Ireland and the Channel Isles, descending to the coast-level, and reaching an elevation of nearly 2000 feet in the Highlands of Scotland. When growing exposed, it is a harsh rigid-looking plant, but when in its most luxuriant state, in sheltered lanes or woods, it is extremely beautiful, its expansive fronds, eight to ten feet or more in height, gracefully arching out from among the brushwood.

This is a common Fern through Europe, as it appears to be also in most other parts of the world, many so called exotic species being without sufficient distinguishing characters. Its northern limit in Europe appears to be in Lapland, in about 67° N., where, according to Wahlenberg, it is rare. In Asia, it is found in the Caucasus; in

* Moore, in *Gardeners' Chronicle*, 1858, 878.

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the Ural range, in the Altai, in Siberia in the region of the Lake Baikal; in Sitka, Kamtschatka and China; all over India from Nepal and the chain of the Himalaya to the Peninsula and Ceylon; in Penang, Java, and the Philippines; in the Isle of Pines, and in the Sandwich Isles. In Africa, it occurs at the Cape of Good Hope, and in Abyssinia; in Sierra Leone and Senegambia, and at Fernando Po; in the Mauritius and Bourbon; in Northern Africa at Algiers; and in the Atlantic Isles of Teneriffe, Madeira, the Canaries, the Azores, and the Cape de Verds. In America it has been found in California; in Guatemala, North-West Mexico, Veragua, and Pernambuco; and in several parts of North America, *e. g.*, Canada, Massachusetts, Kentucky, etc.

The *Pteris lanuginosa* of Bory, under which name Agardh includes Thunberg's *P. capensis*, is not distinguishable as a species from *P. aquilina*, the approximate segments and nodose base of the rachides being both equally found in British specimens of *P. aquilina;* whilst the woolliness or pubescence of the surface is too variable to be much relied on: *lanuginosa* itself, moreover, sometimes having the segments distinct. Hence we are unable to separate it as a permanent and clearly marked variety, though its various forms appear to be analogous to those undivided British sub-forms we have called *integerrima*. In like manner, the *P. recurvata, firma* and *Wightiana* of Wallich, and the *P. excelsa* of Blume, offer no distinguishing specific characters, but accord with our sub-variety *integerrima*. The *P. caudata* of the West Indies and the Southern United States, with long narrow-tailed divisions, may be considered a fairly marked variety; as may also the broad-pinnuled form, *P. latiuscula* of Desvaux, figured by Schkuhr (t. 96 *b*) under the name of *P. caudata*, a native of North and North-West America, and found also in the Madeiras. The *Pteris esculenta* of Australasia presents an appreciable character, in the short interjected lobe developed between the ordinary segments of the pinnules, and might without inconvenience be kept distinct, including as varieties the South American *P. arachnoidea* of Kaulfuss, and the Indian *P. semihastata, densa*, and *lorigera*, of Wallich.

In former times this common Fern seems to have had a medi-

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cinal reputation, the succulent caudices and the young fronds being used in decoctions and diet drinks, and in chronic disorders of all kinds arising from obstructions of the viscera and the spleen. It has, however, fallen into disuse in modern practice; though as Lightfoot states,* the country people still retain some of its ancient uses, for they give a powder of it to destroy worms, and look upon a bed of the green plant as a sovereign remedy for the rickets in children. Dr. Deakin states,† that it is still retained in the Materia Medica, as a remedy against the tape-worm. The powdered rhizome is given in one to three drachm doses for several mornings, followed by a brisk purgative, and this is said to have been useful when all other remedies have failed. M. Pescher of Geneva, submitted the caudices to the action of sulphuric ether, and obtained the active principle in the form of an oily resinous substance which he used most successfully. According to Dr. Lindsay,‡ the plant is possessed of very astringent properties, from containing a considerable amount of tannic and gallic acids, and in consequence of this has been much used as an anthelmintic.

The *Pteris* is applied to various economic uses; indeed, in this point of view, it is the most valuable of our native Ferns. The fronds are in many parts of the country cut dry, and stored to be employed as bedding or litter for cattle; and Mr. Newman informs us, that in some parts of Wales they are chopped up in the dry state and given with straw or hay, to horses and mules. These fronds also make an excellent thatch that does not harbour insects, or hold moisture, and is moreover, durable, especially if the stalks are used; and they form a dry elastic packing material, which is extensively made use of. The dry fronds form a capital material for the packing and storing of fruit, on account of their not becoming musty, or imparting a disagreeable flavour. They form, moreover, an efficient covering material in gardens, for the preservation of plants from injury by frosts; and as fuel they are much used in country places, for heating ovens, kilns, &c.

The fronds when cut green, make good manure for land, on

* Lightfoot, *Flora Scotica*, ii. 659.
† Deakin, *Florigraphia Britannica*, iv. 57.
‡ Dr. W. Lauder Lindsay, in *Phytologist*, iv. 1065.

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account of their richness in mineral constituents, and in nitrogen. According to Sprengel, the fresh gathered fronds, air-dried, contain in 10,000 parts:—

Silica	1040
Lime	433
Magnesia	152
Potash	1050
Soda	370
Alumina	52
Oxide of iron	150
Oxide of manganese	36
Sulphuric acid	95
Phosphoric acid	60
Chlorine	258
	3696

So that upwards of one-third of their bulk consists of mineral substances. Sprengel also states that the dry herbage is rich in nitrogen. This useful manurial quality is not a recent discovery, for Lightfoot, already quoted, has recorded that on account of the great quantity of alkaline salts in its composition, Fern is a great improver of land; and that when used for manuring potatoes it never fails to produce a good crop.

The stout underground caudices or stems (or 'roots' as they are often called) are not unfrequently used as food for pigs, these animals being very fond of them. The young fronds are also employed for the same purpose; they are gathered when quite tender, and boiled or simmered for a couple of hours in water, the liquor thus obtained forming when cold a strong jelly, which appears to be equal in value to potatoes for pig-feeding. The mucilaginous mass obtained in this way, by boiling the green fern sprouts, will keep for a considerable time; and Mr. Lees states* that the cottagers find it very serviceable, from its coming in at a time when garden refuse produce available for the pig-stye, has become scanty. He suggests also, that a dish of boiled *Pteris* in its circinate state might not be very unpalatable with a rasher of bacon to a hungry man.

The succulent underground stems both of the Common Bracken, and of some of its varieties or near allies which inhabit various parts of the world, have been used as food for man. The fern

* Lees, in *Phytologist*, i. 263.

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'root' eaten by the New Zealanders, prepared by a rough process, that of being roasted and pounded between stones, rejecting the woody portions, is the caudex of one of these plants, *P. esculenta*, which is regarded by some botanists as a mere variety of *P. aquilina*. The latter, according to Lightfoot, furnished, in times of necessity, to the poorer inhabitants in Normandy, an ingredient used in the composition of their bread; and in Siberia, and other northern countries, the stems are said to be sometimes used in brewing ale, one-third of the fern 'root' being employed along with two-thirds of malt. Fern bread after all is not such despicable fare as might be supposed. Some years ago, Mr. Forsyth* having obtained a quantity of the stems, when clearing some waste ground, and observing them to be replete with something like pure white starch, made some experiments to ascertain their qualities; he had them cut into short pieces, clean washed, and grated; the pulp after washing to free it of slimy matter, and after straining through a fine wire sieve, yielded something like coarse brown flour. When the brown outer coating was scraped off before grating, a clean sago-like jelly was obtained, and this, when boiled, had no disagreeable taste, and when dried was quite white. Mr. Forsyth states that beer may certainly be obtained from the clean washed pulp; and as by certain processes these waste materials might be made into bread, and assuredly would make good beer, he regards them as being too valuable to be neglected. The Rev. M. J. Berkeley has recently afforded some further information respecting the nutritive properties of these succulent stems. "Having had occasion," he writes,† "to examine the rhizoma of our common Bracken, it became a matter of interest to ascertain what sort of food might be afforded by it. I accordingly roasted some of the rhizomata, and found them eatable, but extremely disagreeable from their slimy consistence and peculiar flavour, in both of which respects they precisely resemble ill-ripened Brinjals. It struck me, however, that they might afford a better food if the slimy matter could be removed. I accordingly scraped some of the rhizomata which had first been washed and peeled, avoiding however the two columns of hard coloured tissue with

* Forsyth, in *Gardeners' Chronicle*, 1847, 189.

† Rev. M. J. Berkeley, in *Journal of Proceedings of Linnæan Society*, i. 156.

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which they are threaded, and then placed the pulp thus obtained in water. After four-and-twenty hours the water had become extremely slimy, and of a yellow brown. This was carefully decanted, and the pulp washed again with water, which was now quite colourless. This also was decanted, and the pulp when sufficiently dry was kneaded into a cake, and baked upon the hearth. The result was a coarse but palatable food, perfectly free from any disagreeable flavour: much better indeed to my taste, and probably not less nutritious, than Cassava bread."

The young fronds of *P. aquilina*, when sprouting, and while quite young and tender, have been recommended * to be used as a blanched vegetable like asparagus. Dr. Clarke writes:—"The properties of Ferns are tonic, antibilious, and decidedly deobstruent; and therefore a Fern, if esculent, might be expected to be very serviceable as a change of diet to those labouring under dyspepsia and its consequences. And as we have no Fern or other allied plants in use as articles of food, an esculent vegetable taken from a class of plants so widely different from all those at present cultivated, might be expected to be not without its advantages. The result of my inquiry, which was extended over six weeks, is entirely in the affirmative, as far as that the young fronds when completely blanched are an agreeable esculent vegetable, parcels of them having been sent as a new unnamed vegetable to parties who have all of them in return sent written acknowledgments to that effect. The young fronds should be cut as soon as they first begin to appear at the surface of the ground, and as low down as may be; and when quite blanched boiled for one hour; but if tinged with green, for an hour and a quarter, or an hour and a half, the leafy part in the latter instance being rejected; a quantity of salt being added to the water sufficient to give the vegetable a slightly saline flavour. They however retain, when at all green, a somewhat harsh herbaceous flavour, not unlike that of tea, requiring some such sauces as are used with asparagus to give them a palatable flavour. But this may be expected to disappear if the plant is cultivated or even partially cultivated in its native place of growth, as in some fronds which had become completely blanched through sand having been

* Dr. B. Clarke, in *Hooker's Kew Journal of Botany*, ix. 212.

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thrown over a mass of the plant, it was scarcely or not at all perceptible, although they had become six or eight inches in height. The vegetable in this condition was considered preferable to garden spinach, and also to have a more beneficial effect on the digestive organs."

The stems and caudices of this common plant contain so large a quantity of tannin and astringent matter, that they are used in many places abroad in dressing and preparing kid and chamois leather. The plant also abounds in alkali, which is turned to various uses. In the north the fronds are cut green and burnt, and the ashes are made up with a little water into balls, which are dried in the sun, and used in the washing of linen in lieu of soap. They are indeed sometimes mixed with tallow to form a kind of home-made soap. In the western isles of Scotland a considerable profit was formerly made by the sale of fern ashes to the soap and glass makers; and in the mountainous parts of Wales it is related by Mr. Bladon * that the plant is collected, and dried, and afterwards burned in large heaps, for the sake of the alkali contained in the ashes; these being sprinkled with water to cause them to adhere together, are rolled into balls two inches or upwards in diameter. The balls when thoroughly dried are sold in the markets, or even in the shops, the price varying from 3*d.* to 8*d.* per dozen. They are much prized by some housewives on account of their utility in economising soap. When about to be used, they are put into the fire, and being heated to red heat are thrown into a tub of water; the water in the course of an hour or so becomes a strong ley fit for use.

The Bracken is not an ornamental Fern for garden purposes; indeed, in pots or in small rockeries, it is rather weedy than ornamental, but there are nevertheless situations in which it may be cultivated with advantage. Thus, for example, it may be grown for ornament about the margins of that class of plantations which skirt the approach roads to mansions, or screen unsightly objects; and it may also be used with advantage for the purpose of affording shelter, or cover in the more open plantations of parks and paddocks. There has been an impression that the Bracken is difficult to transplant

* Bladon, in *Annals and Magazine of Natural History*, n. ser. iv. 242.

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successfully—an impression which may probably be traced to a statement made by Sir J. E. Smith, to this effect. If, however, the subterraneous horizontal caudex is dug up in winter, without injury, and planted with ordinary care, there is little risk of failure. The plant is not particular as to soil, though no doubt a deep sandy loam is most congenial to it. When a plantation is required, the ground should be trenched, and the stems carefully dug out in spring, and planted in drills two or three inches deep. A dressing of leaf-mould over the surface in winter is beneficial.

There are but few varieties of the Bracken yet discovered; those which have been observed are the following:—

1. *integerrima* (M.). The peculiarity of this form consists in the entire or undivided condition of the secondary pinnules (pinnulets). These pinnulets instead of being deeply pinnatifid, are nearly all quite entire, here and there only slightly crenate-lobate at the base. It may perhaps merge into the pinnatifid form, but many plants and whole patches of plants are found in which this peculiarity is characteristic. The plant, which is very well figured by Dr. Deakin (*Florigr. Brit.* iv. 55, fig. *e*), is probably not uncommon. We have specimens from—Devonshire: Marwood, *Rev. F. Mules.* Middlesex: Hampstead Heath, *T. M.* Hertfordshire: St. Albans, *H. D. Henslow.* Buckinghamshire: High Wycombe, *R. Heward.* Bedfordshire: Potton, *R. Heward.* Durham: Teesdale. Westmoreland: Windermere, *F. Clowes.* Dumbartonshire: Tarbet, *T. M.* Perthshire: by Loch Katrine, *T. M.* Wicklow: Dingle, *R. Barrington.* Dublin: Three-Rock Mountain, *R. B.*

2. *crispa* (Woll.). There are two forms of this variety, both corresponding in habit with the normal form of the species, but occasionally multifid. In one of these the margins of the pinnulets are entire undulate and reflexed; in the other they are crenate and wavy. It is figured by Dr. Deakin (*Florigr. Brit.* iv. 54, fig. *g*). It is not very uncommon, but a local variety. We have seen it from—Middlesex: Hampstead Heath, *T. M.* Kent: Shooter's Hill, *G. B. Wollaston.* Devonshire: Marwood, *Rev. F. Mules.*

3. *multifida* (Woll.). This, in its best condition, is a rather unusual and scarcely permanent form of the plant. There are two

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sub-forms of it: one, in which the apex of the frond and the apices of most of the primary pinnæ are multifidly-branched and more or less crisped; the other in which the apex of the frond and of the primary pinnæ are rarely multifid, but the apices of the secondary pinnæ (pinnules) and many of the pinnulets are divided instead. The former we have seen from—Kent: Chislehurst, *G. B. Wollaston.* Devonshire: Chagford, *Rev. J. M. Chanter.* Westmoreland: Windermere, *F. Clowes* (combining both forms). Cumberland: Keswick, *Miss Wright.* Guernsey, *C. Jackson.* The latter from—Kent: Cobham Park, *S. O. Gray.* Devonshire: Barnstaple, *H. F. Dempster;* Chagford, *Rev. J. M. Chanter;* Ottery St. Mary, *G. B. Wollaston.* Guernsey, *Miss Isabella Wilkinson;* also *J. James* (fine and combining both forms).

4. *depauperata* (Woll.) This is a curiously depauperated subpermanent form occasionally multifid. The fronds are sometimes irregularly branched, and the pinnulets (or rather the shortened lobes) are decurrent, and depauperated or occasionally interrupted. It has been found near Chislehurst, Kent, by Mr. Wollaston; at Bowness, in Cumberland, by Mr. Wood; and at Marwood, near Barnstaple, by the Rev. F. Mules.

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Genus XII: **ADIANTUM,** *Linnæus.*

Gen. Char.—**Sori** indusiate, transverse marginal, reniform oblong or linear, continuous or interrupted; the **receptacles** seated on the under surface of the indusium, and proceeding from the apices of two or more converging venules. **Indusium** (inverted membranaceous marginal lobe) venulose, sporangiferous beneath on the venules, the receptacles therefore resupinate. **Veins** flabellately-forked, or forked from a medial costa, the furcations repeated; **venules** parallel, free, continued in the fertile parts into the indusium.

Fronds coriaceous or herbaceous, simple pinnately or pedately divided or supradecompound; pinnæ often articulated, usually dimidiate with the costa wanting. **Stipites** and **rachides** ebeneous.

Caudex tufted, or short creeping.

This is an exceedingly well-marked and easily recognised genus, though presenting considerable variety of character in the species of which it is composed, which vary from simple and kidney-shaped to many-times pinnate with numerous ultimate pinnules.

The technical character of *Adiantum* consists in the resupinate character of the fructification. The indusium which is an altered reflexed marginal lobe, appears to be turned over on the spore-cases as is the case in other marginal fruited indusiate ferns, but in reality it is not so. The indusium is indeed turned over as usual, but the spore-cases are attached to it, on the surface which then becomes undermost. In reality therefore, the spore-cases instead of having the indusium lying on them, hang down as it were from the indusium itself, being apparently upside down, and this is what is intended when they are said to be resupinate.

The species of *Adiantum* though all agreeing in this resupinate character of the fructification, are yet very varied as to their external appearance. These external differences, together with some pecu-

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liarities of venation, have given rise to their being distributed in three sectional groups, which are the following:—§ *Mesopleuria*, represented by the West Indian *A. Wilsoni*, and the South American *A. lucidum*, in which there is a medial costa, and the sori are linear elongate and continuous; § *Synechia*, represented by the West Indian *A. pulverulentum*, and *A. villosum*, in which the costa is wanting, and the sori are elongate and continuous: and § *Adiantellum*, represented by the native *A. Capillus-Veneris*, and the Brazilian *A. cuneatum*, in which the costa is wanting, and the sori are short, of a rounded or oblong form. These three sections embrace a considerable number of species widely dispersed over the earth.

At first sight, the two forms of sori which are found among the species of this genus, appear to be the one like that of *Pteris*, and the other like that of *Cheilanthes;* and there is undoubtedly much outward resemblance between them. There can be, however, no difficulty in distinguishing either of these genera from the correspondent series of *Adiantum*, when it is remembered, that whilst in *Pteris* the receptacle is linear and marginal, and the indusiform margin overlies the line of spore-cases attached thereto, and in *Cheilanthes*, the receptacle is a point close to the margin at the apex of a vein, also covered by a reflexed roundish lobe-like marginal scale, the spore-cases in *Adiantum* are attached to the cover itself and are turned over along with it.

The name *Adiantum* is a latinised form of the Greek *adianton*, derived from *adiantos*, dry or unmoistened, and seems to apply to a property possessed by these plants of repelling water from the surface of their fronds, so that they cannot easily be wetted.

BRITISH SPECIES.

A. Capillus-Veneris: a perennial, with bi-tri-pinnate fronds of which the wedge-shaped pinnules are set on black hair-like stalks.

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THE COMMON MAIDENHAIR FERN.

ADIANTUM CAPILLUS-VENERIS

A. fronds bi-tri-pinnate; pinnules smooth, membranaceous, obliquely roundish wedge-shaped, or with a truncate base, attached by capillary stalks, lobed on the anterior margin, the sterile lobes dentate; sori transversely oblong, often occupying the whole of the lobes; stipes and rachis black, glossy. [Plate C.]

ADIANTUM CAPILLUS-VENERIS, *Linnæus, Sp. Plant.* 1558. *Bolton, Fil. Brit.* 24, t. 29. *Smith, Eng. Bot.* xxii. t. 1564; *Id., Eng. Fl.* 2 ed. iv. 307. *Hooker & Arnott, Brit. Fl.* 7 ed. 591. *Babington, Man. Brit. Bot.* 4 ed. 428. *Mackay, Fl. Hib.* 344. *Deakin, Florigr. Brit.* iv. 49, fig. 1586. *Newman, Hist. Brit. Ferns,* 3 ed. 1. *Moore, Handb. Brit. Ferns,* 3 ed. 229; *Id., Ferns of Gt. Brit. Nature Printed,* t. 45; *Id., Ind. Fil.* 21. *Sowerby, Ferns of Gt. Brit.* 70, t. 40. *Bentham, Handb. Brit. Fl.* 636. *Jacquin. Misc. Aust.* ii. 77, t. 7. *Willdenow, Sp. Plant.* v. 449. *Presl, Tent. Pterid.* 158. *Hooker, Gen. Fil.* t. 66 B; *Id., Sp. Fil.* ii. 86. *Fée, Gen. Fil.* 114; *Id., Iconogr. Nouv.* t. 12, fig. 2. *Nyman, Syll. Fl. Eur.* 433. *Koch, Syn.* 2 ed 985. *Ledebour, Fl. Ross.* iv. 527. *Mettenius, Fil. Hort. Lips.* 48.

ADIANTUM AFRICANUM, *Brown, App. Tuckey's Voy.* 462 (name only).

ADIANTUM CAPILLUS, *Swartz, Schrad. Journ. Bot.* 1800, ii. 83. *Sprengel, Syst. Veg.* iv. 113. *Link, Fil. Sp.* 70.

ADIANTUM CORIANDRIFOLIUM, *Lamarck, Fl. Franç.* i. 29; *Id., Enc. Bot.* i. 43; *Id., Illustrationes,* t. 870, fig. 1.

ADIANTUM CUNEIFOLIUM, *Stokes, Bot. Mat. Med.* iv. 612.

ADIANTUM DEPENDENS, *Chapman MS. in Hb. Hooker.*

ADIANTUM FONTANUM, *Salisbury, Prod.* 404. *Gray, Nat. Arr. Brit. Plants,* ii. 17.

ADIANTUM MORITZIANUM, *Link, Fil. Sp.* 71. *Fée, Gen. Fil.* 114. *Kunze, Lin.* xxiii. 216.

ADIANTUM REPANDUM, *Tausch;* "*Sieb. Exsic.* 176;" according to Klotzsch.

ADIANTUM TENERUM, *Roxburgh, Calc. Journ. Nat. Hist.* iv. 513.

ADIANTUM TRIFIDUM, *Willdenow, Herb.* 20108. *Bolle, Bonpl.* iii. 121.

Caudex slowly creeping, about as thick as a small goose quill, densely scaly. *Scales* dark brown, narrow lanceolate acuminate, striately venose. *Fibres* wiry, branched, shaggy.

Vernation circinate.

Stipes about as long as the fronds, having a few scattered scales near the base, lateral, and adherent to the caudex; and as well as the *rachis,* slender, blackish-purple (ebeneous), smooth, shining.

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Fronds usually ovate or triangular, sometimes oblong or lanceolate, membranaceous, glabrous, bright green, drooping, from six to twelve or sometimes eighteen inches in length, bipinnate or tripinnate. *Pinnæ* and *Pinnules* alternate; the latter attached by short capillary stalks, of various forms: roundish with the base truncate, subtrapeziform, obovate or obliquely fan-shaped, generally more or less cuneate at the base, the posterior margins entire, the anterior lobate. In the sterile fronds the lobes are dentate or incisodentate; in the fertile ones they are obtuse or truncate, the sori often occupying their entire width.

Venation of the pinnules consisting of a series of dichotomous ramifications of the vascular bundles of the petioles, the first furcation forming the extreme base of the pinnule; the *veins* are again and again forked in a flabellate-radiate manner, so that the whole pinnule becomes traversed by a series of contiguous and nearly parallel *venules*, which are disunited at their apices. In the sterile portions, one of these venules is directed to each marginal tooth, in the apex of which it terminates; whilst in the fertile portions, the venules extend to the margin, and being continued thence nearly across the indusium, there form the receptacles.

Fructification generally distributed on the back of the fronds. *Sori* oblong, borne on the apices of all the lobes into which the anterior margin of the pinnule is divided, more or less lengthened according to the width of the lobe; attached to the under surface of the indusium. *Indusium* of the same form as the sorus, consisting as it were, of a portion of the apex of the lobe, reflexed, and changed in texture into a thin bleached veiny membrane, the veins being the receptacles. *Spore-cases* globose. *Spores* roundish or angular, ovate, smooth.

Duration. The rhizome is perennial. The fronds are persistent, remaining until after young ones are produced, if kept from being injured by frost. The young growth commences in April or May.

This is unlike every other British Fern; its black shining slender stipites, its capillary ramifications, and its fan-shaped or wedge-shaped pinnules, irrespective of its fructification, serve at once to distinguish it.

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The plant is a maritime rock Fern scarcely ascending above the sea level. The situations in which it occurs are described as sea cliffs, within reach of the spray; sea caves; the faces and vertical crevices of coast rocks; the gulleys of the cliffs where little rills of fresh water dribble down from above, depositing a travertine sediment. Mr. Johnson describes this in a letter to Mr. Maw, thus:—"The *Adiantum* at Dunraven grows luxuriantly, forming a green tapestry on the face of the cliff. It grows in a sort of travertine formed by the filtration of a calcareous spring through hypnum and other mosses, and is so hard, that without the assistance of my geological hammer and chisel, I could not have detached any of it. Some of the fronds in the cavities of the rock are eight or ten inches long or longer, but I could not reach them. Those in the face of the cliff are not above two or three inches in length. The rock faces due west, and is fully exposed to the wind, and even spray. Over it comes a stream of clear water, which spreading as it falls drips from stone to stone, and keeps the surface constantly wet. The substance formed by the petrifaction of the mosses and marchantias is in places many inches thick, some of it harder than the lias itself." This rare plant is found in Cornwall, Devon, and Somerset, in Glamorgan and in some adjacent isles. The Isle of Man is its northern certified limit. In Ireland, it has been found in Galway; in the Arran Isles; in Kerry; and in Clare. There are, besides, reputed habitats, which require verification—in England, in the counties of Stafford, Salop, Derby, and York; and in Scotland, in those of Bute and Kincardine. In the latter county, Mr. D. Hutcheson informs us that he found it, in 1842, on rocks near the sea, north-east of Stonehaven, which nearly accords with the originally published station in this county, namely, the banks of the Carron. It is met with, but is apparently rare, in Jersey. The principal recorded stations are distributed thus:—

Peninsula.—Cornwall: Carclew, *Miss M. J. Fox;* Penzance; Carrick Gladden, *Rev. J. Harris;* St. Ives, *Rev. J. S. Tozer;* and elsewhere, between St. Ives and Hayle, in low dripping sea-caves and on coast rocks. Devonshire: Ilfracombe, *Rev. J. M. Chanter;* White Pebble Bay, *N. B. Ward;* Rillidge Point, *N. B. W.;*

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Watermouth, near Ilfracombe, *Miss A. Griffiths;* Mudstone Bay, near Brixham; Berry Head; Mewstone Bay, *T. B. Flower.* Somersetshire: Clevedon, *L. H. Grindon;* stone quarry at Combedown, near Bath, *E. J. Lowe;* Cheddar Cliffs, *Rev. W. H. Hawker.*

Severn.—? Staffordshire. Shropshire: Titterstone Clee Hill, *Mr. Westcott.*

Trent.—? Derbyshire.

Humber.—? Yorkshire.

Lakes.—Isle of Man: Glen Meay, *T. G. Rylands;* between Douglas and Peel.

S. Wales.—Glamorganshire: Dunraven, *Miss M. Waring;* East Aberthaw, *F. Brent;* Swansea, *J. Riley;* Port Kirig; Barry Island.

E. Highlands.—? Kincardineshire: banks of the Carron; rocks near the sea, north-east of Stonehaven, 1842, *D. Hutcheson.*

W. Highlands.—? Arran.

Connaught.—Galway: Lough Bulard, near Urrisbeg, *C. C. Babington;* Roundstone, Connemara. Arran Isles, *G. Maw.*

Munster.—Kerry: Cahir Conree, near Tralee, *W. Andrews.* Clare: from Ballyvaughan, round Black Head to Cremlin Point, *W. Bennett.*

Channel Isles.—Jersey, rare, *Rev. W. Greenwell.* Guernsey.

The Common Maidenhair Fern or Maidenhair Adiant, as Mr. Bentham styles it, is found dispersed over the middle and south of Europe. Besides Great Britain and Ireland it occurs in Switzerland, in the Tyrol, in Belgium, in France on the Jura range, in Spain and Portugal, in Italy, in Dalmatia, in Greece and Turkey. In Asia, it occurs throughout India, chiefly in damp hilly districts, *e.g.* Neilgherries, Malabar, Oude, Kashmir, Affghanistan, Scinde, Beloochistan, Thibet, Kumaon, Khasya, Sikkim-Himalaya, Nepal, Simla, Assam, Bhotan, Ava, Moulmein, &c.; in Java; in China; in Persia; in Arabia Petræa, and in Syria; in the Caucasus, and according to Ledebour in the Ural provinces of Siberia. In Africa, it is found in the north at Algiers, and in Abyssinia and Egypt; again in Teneriffe, Madeira, the Canaries, the Azores, and the Cape de Verd Islands; in Madagascar and the Mascaren Islands; and in South Africa, in Natal, and at Algoa Bay. It is met with in the

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temperate parts of North America: *e.g.* Florida, Arkansas, Alabama, California, Texas; in South America: Mexico, Guatemala, Santarem, Para, Caraccas, Chili; in the West Indies: Trinidad, St. Vincent's, Dominica, Jamaica; in the Sandwich Islands, in New Caledonia, and in the New Hebrides at Anieteum. These habitats, those of the New World especially, include several gradations of a deeply-lobed form, which in its most marked condition is the var. *β.* (*incisum*) of Sir W. J. Hooker.

This plant like many other Ferns had formerly a high medicinal reputation, which has not been sustained. This was especially employed as a diuretic and expectorant. It is now only used in the preparation of Capillaire, to which it gives its name and a slight flavour. This preparation, known in the shops as Syrup of Capillaire, is made by pouring boiling syrup upon the freshly gathered fronds, and is perfumed with orange flowers. Dr. Deakin states that an infusion of the plant is also used, in the form of tea, and that it makes a pleasant drink in cases of fever. Though abundant in the south of Europe, where Capillaire is chiefly made, the *A. pedatum* of North America is often substituted for it, being cultivated for the purpose according to Mr. Johnson. Both species are astringent, and regarded as useful in coughs, &c., but a strong decoction of the North American kind is stated to possess emetic properties. Capillaire is known throughout Europe as a refreshing beverage, when diluted with water. In Arran a decoction of the leaves is used instead of tea.

The Maidenhair grows freely in a moist close greenhouse, or in a hothouse, the temperature of which it enjoys. It grows very readily in baskets, and is also well suited for pot-culture. When grown in pots, it should be planted in the usual light compost used for Ferns, with abundant drainage; and the caudex should not be buried in the soil, but kept at the surface. The best compost of this nature, is made of small broken lumps of turfy peat, with a small proportion, not more than one-fourth, of light mellow loam, and an abundant admixture of silver sand. The small size and exceedingly elegant character of the Maidenhair renders it well suited for a Wardian case, for which also its habit is quite adapted. The plants are injured by severe cold, even when in a closed house, so that it

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cannot be considered a hardy Fern. They may be increased by division of the caudex, and sometimes by means of little bulbils which are developed on the edges of the pinnules. Mr. Clapham has sent us a very interesting example of this proliferous growth produced in his fernery; in this case not only the edges of the pinnules but the axils of those near the top of the frond produce little scaly bulbs or buds.

A Fern ranging so widely over the world might be expected to show some modifications of form, and such is indeed the case, though only two or three, and these not very strongly marked, are met with in this country. These are the following:—

1. *ramulosum* (M.). This form is chiefly remarkable for having the main rachis divided two or three times near the top, so that the apex of the frond is formed of a spreading tuft of short pinnate branches. The pinnules are here and there reduced or split unequally into narrow portions, or of unequal size, so that there is a partial depauperation below and an excess of development of the apex. This appears to be more or less the case with all the fronds. It is of Irish origin, and has been sent by Mr. Clapham.

2. *incisum* (M.). This form has both the barren and fertile pinnules throughout the frond somewhat regularly split down into long narrow wedge-shaped lobes, but is otherwise of the usual growth. There are various gradations of this variety, both native and foreign. It is somewhat rare in this country, but is occasionally met with. It has been found in Ireland by Dr. Allchin; Mr. Newman records it from Mewstone Bay, in Devonshire; and it has been sent from Guernsey by Mr. James.

3. *rotundatum* (M.). This sub-variety, found in the Isle of Man by Mr. T. G. Rylands, and occurring also in a nearly similar form on the south-west coast of England, has a peculiar aspect. The chief peculiarity in the most marked, *i.e.*, the Manx plant, consists in the basal pinnules having a rounder outline than usual, with the base truncate; in addition, the fronds are narrow, and the pinnæ more spreading. The usual cuneated base which is wanting in these pinnules, appears, however, in the upper parts of the same fronds.

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Genus XIII: CYSTOPTERIS, *Bernhardi.*

Gen. Char.—**Sori** indusiate, rotundate, the **receptacles** medial. **Indusium** roundish-ovate, fornicate or concave, affixed by its broad base, the apex often lacerate, sometimes acuminate. **Veins** simple forked or pinnate from a central costa; **venules** free.

Fronds membranaceo-herbaceous, bi-tri-pinnate.

Caudex tufted, decumbent, or elongated and creeping.

This small genus of delicate-fronded Ferns belongs to that group in which the sori are dot-like or punctiform, growing from a medial point at the back of the veins. The sori are covered by a peculiar kind of indusium, which instead of being plane is hollow or concave, and is fixed to the vein behind the sorus, so as to cover it like a hood.

The affinity of this genus has been variously understood. Thus it has been referred to the cyatheaceous series by some botanists of repute, to the neighbourhood of *Athyrium* by others, but more commonly to the *Aspidieæ*, with which its punctiform indusiate sori at first sight seem to have close affinity. We have been led to regard it as indicating a peculiar structure, intermediate between the *Aspidieæ* and the *Davallieæ*, and have consequently made it the type of a small group called *Cystopterideæ*.

This group, *Cystopterideæ*, is, as already intimated, one of those in which the sori are punctiform, medial, and indusiate. Its distinguishing feature consists in the attachment of the indusium, which being roundish in general outline, is attached behind the spore-cases transversely by its base, the front and side parts being free. The *Aspidieæ* on the one hand, differ from this in having the indusium attached by its centre or its sinus, and the *Davallieæ*, in a restricted sense, differ on the other hand in having the indusium attached by its base and sides, the anterior portion only being free. This is nearly the view taken of the affinities of the genus

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by Sir W. J. Hooker, who, however, does not separate it from the *Davallieæ*, but observes that "it may assuredly be considered a connecting link between the *Davalliaceæ* and the *Aspidiaceæ*, harmonising better with the former than with the latter, especially with the group *Leucostegia*." This group *Leucostegia* is, we think, better separated from *Davallia* and combined with *Acrophorus*, under which name it forms a good genus of the *Cystopterideæ*.

The indusium of *Cystopteris* when assuming the truncated semi-calyciform character it sometimes bears, appears to stand in the same relation to the hemitelioid scale found behind the sorus in some species of *Alsophila*, as the more perfect cup-like indusium of *Woodsia*, a true cup in some exotic species, does to that of *Cyathea*. These genera thus become, to a certain extent, connecting links between the polypodiaceous and cyatheaceous series.

The few species referred to *Cystopteris*, are widely dispersed, occurring chiefly in temperate climates of both the old and new world, and of both hemispheres. They also extend to the arctic regions and to the tropics.

The name of the genus comes from the Greek *kystos* a bladder, and *pteris* a fern, whence the English name Bladder Fern

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SYNOPSIS OF THE SPECIES.

Fronds lanceolate; caudex short tufted.

† *Fronds bipinnate.*

1. **C. fragilis**: pinnules (of the middle part of the frond) ovate acute, pinnatifid or subpinnate; teeth of the segments acute.

   var. **angustata**: pinnules lanceolate or lanceolate-ovate, pinnatifid or subpinnate; teeth of the segments narrow elongated acute.

   var. **dentata**: pinnules oblong or oblong-ovate, distinct, pinnatifid; teeth of the segments blunt.

   var. **Dickieana**: pinnules oblong or oblong-ovate, imbricated, lobate, with shallow blunt teeth; pinnæ deflexed.

†† *Fronds subtripinnate; pinnæ ovate.*

2. **C. regia**: pinnules ovate-oblong, deeply pinnatifid or pinnate; ultimate segments linear, with short blunt or retuse teeth.

** *Fronds deltoid or subpentangular; caudex creeping.*

3. **C. montana**: fronds tripinnate.

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THE BRITTLE BLADDER FERN.

CYSTOPTERIS FRAGILIS.

C. fronds membranaceous oblong-lanceolate, bipinnate; pinnæ ovate-lanceolate or oblong-lanceolate; pinnules ovate lanceolate or oblong, blunt or acute, toothed, incised or pinnatifid.

—(type): pinnæ acute, pinnules ovate or lanceolate, acute, pinnatifid with ovate or oblong toothed segments; sori medial. [Plate CI.]

CYSTOPTERIS FRAGILIS, *Bernhardi, Schrad. neues Journ. Bot.* i. part 2, 26, 49, t. 2, fig. 9. *Hooker & Arnott, Brit. Fl.* 7 ed. 587. *Babington, Man. Brit. Bot.* 4 ed. 423, incl. β. *Deakin, Florigr. Brit.* iv. 85, fig. 1600. *Mackay, Fl. Hib.* 341. *Newman, Hist. Brit. Ferns*, 3 ed. 87. *Moore, Handb. Brit. Ferns*, 3 ed. 233; *Id., Ferns of Gt. Brit. Nature Printed*, t. 46 A, fig 1. *Bentham, Handb. Brit. Fl.* 636. *Sowerby, Ferns of Gt. Brit.* 36, t. 19. *Hooker, Gen. Fil.* t. 52 B; *Id., Sp. Fil.* i. 197. *Schott, Gen. Fil.* (t. 8). *Link, Fil. Sp.* 46. *Presl, Tent. Pterid.* 93, t. 3, fig. 1. *Fée, Gen. Fil.* 299. *Mettenius, Fil. Hort. Bot. Lips.* 97. *Koch, Syn.* 2 ed. 980. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 516. *A. Gray, Bot. N. United St.* 596 *Pappe & Rawson, Syn. Fil. Afr. Aust.* 16. *Lowe, Nat. Hist. Ferns*, vii. t. 31.

CYSTOPTERIS ORIENTALIS, *Desvaux, Prod.* 264; according to Hooker.

CYSTOPTERIS VIRIDULA, *Desvaux, Prod.* 264.

POLYPODIUM FRAGILE, *Linnæus, Sp. Plant.* 1553. *Bolton, Fil. Brit.* 50, t. 27 (bad), and t. 46. *Fl. Dan.* iii. t. 401. *Poiret, Enc. Bot.* v. 539 (excl. B).

POLYPODIUM ANTHRISCIFOLIUM, *Hoffmann, Deutschl. Fl.* ii. 9; *Id., Rœm. and Ust. Bot. Mag.* ix. 11, fig. 14, *c, e.*

POLYPODIUM CYNAPIFOLIUM, *Hoffmann, Deutschl. Fl.* ii. 9.

POLYPODIUM POLYMORPHUM (B) LACINIATUM, and (D) FRAGILE, *Villars, Hist. Pl. Dauph.* iii. 847, t. 53, figs. B. D.

POLYPODIUM TRIFIDUM, *Withering, Arr. Brit. Pl.* iii. 779.

POLYPODIUM ALBUM, α, *Lamarck, Fl. Franç.* i. 21.

POLYPODIUM FUMARIOIDES, α. LOBATUM, *Weis, Pl. Crypt.* 319. *Hoffmann, Deutschl. Fl.* ii. 9.

ASPIDIUM FRAGILE, *Swartz, Schrad. Journ. Bot.* 1800, ii. 40; *Id., Syn. Fil.* 58. *Willdenow, Sp. Plant.* v. 280. *Schkuhr, Krypt. Gew.* 53, tt. 54, 55, 56. *Sprengel, Syst. Veg.* iv. 107. *Kaulfuss, Enum. Fil.* 242. *Sturm, Fl.* (Farrn.) t. 4. *Nyman, Syllog. Fl. Europ.* 432.

ASPIDIUM TRIFIDUM, *Swartz, Schrad. Journ.* 1800, ii. 41 (excl. syn. Eng. Bot.).

ASPIDIUM DIAPHANUM, *Bory, Hb. Desf.*; according to Webb.

ASPIDIUM VIRIDULUM, *Desvaux, Berl. Mag.* v. 321.

ASPIDIUM NEPALENSE, *Edgeworth MS. Hb. Hook.*

ATHYRIUM FRAGILE, *Sadler, Adumb. Epiphyll. Hung.* 22.

ASPLENIUM FRAGILLIMUM, *Jacquemont MS. Hb. Mus. Par.*

CYATHEA FRAGILIS, *Smith, Mem. Acad. Roy. Sc. Turin*, v. 417; *Id., Fl. Brit.* iii. 1139; *Id., Eng. Bot.* xxiii. t. 1587.

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CYATHEA CYNAPIFOLIA, *Roth, Fl. Germ.* iii. 98.
CYATHEA ANTHRISCIFOLIA, *Roth, Fl. Germ.* iii. 98.
CYSTEA FRAGILIS, *Smith, Eng. Fl.* 2 ed. iv. 285.
CYSTEA REGIA, *Smith, Eng. Fl.* 2 ed. iv. 289 (in part, *i. e.*, the alpine plants).
CYCLOPTERIS FRAGILIS, *Gray, Nat. Arr. Brit. Pl.* ii. 9.

Var. **angustata**: pinnæ acutely elongated, pinnules lanceolate or ovate-lanceolate acute, pinnatifid or incised with long narrow acute teeth; sori medial. [Plate CII C.]

CYSTOPTERIS FRAGILIS, *v.* ANGUSTATA, *Link, Fil. Sp.* 46 (excl. syn. Linnæus, Schkuhr, and Swartz). *Babington, Man. Brit. Bot.* 4 ed. 424. *Deakin, Florigr. Brit.* iv. 85, fig. *c*. *Sowerby, Ferns of Gt. Brit.* 37, t. 20.
CYSTOPTERIS FRAGILIS, β. TRIPINNATA, *Ruprecht, Dist. Crypt. Ross.* 40.
CYSTOPTERIS RHÆTICA, *Link, Hort. Reg. Berol.* ii. 131. *Fée, Gen. Fil.* 299 (excl. syn.).
CYSTOPTERIS DENTATA, β, *Hooker, Brit. Fl.* 1 ed. 445.
POLYPODIUM FRAGILE ANGUSTATUM, *Hoffmann, Rœm. & Ust. Bot. Mag.* ix. 11, fig. 14 *d*.
POLYPODIUM TENUE, *Hoffmann, Deutschl. Fl.* ii. 9.
POLYPODIUM RHÆTICUM, *Dickson, Hort. Sicc. fasc.* i. 17. *Bolton, Fil. Brit.* 80, t. 45. *Withering, Arr. Brit. Pl.* iii. 780. *Poiret, Enc. Bot.* v. 538.
POLYPODIUM POLYMORPHUM (A) RHÆTICUM, *Villars, Hist. Pl. Dauph.* iii. 846, t. 53, fig. A.
POLYPODIUM FUMARIOIDES, β. LACINIATUM, *Weis, Pl. Crypt.* 321.
CYSTEA ANGUSTATA, *Smith, Eng. Fl.* 2 ed. iv. 288 (excl. syn. *Aspidium rhæticum*).
CYATHEA FRAGILIS β. (excl. syn. Ray and Plukenet) and γ, *Smith, Fl. Brit.* iii. 1139.
CYATHEA REGIA, *Roth, Fl. Germ.* iii. 96 (excl. syn. Linnæus).
ASPIDIUM FRAGILE β. *Willdenow, Sp. Plant.* v. 281 (excl. syn. Ray and Plukenet).
ASPIDIUM RHÆTICUM, *Willdenow, Sp. Pl.* v. 280 (excl. syn.).
ATHYRIUM RHÆTICUM, *Sadler, Adumb. Epiphyll. Hung.* 22.
CYCLOPTERIS FRAGILIS, β. RHÆTICA, *Gray, Nat. Arr. Brit. Pl.* ii. 10.

Var. **dentata**: pinnules oblong, blunt obscurely toothed, or shallowly lobed with short blunt teeth; sori submarginal. [Plate CII A.]

CYSTOPTERIS FRAGILIS, *v.* DENTATA, *Hooker, Sp. Fil.* i. 198. *Moore, Ferns of Gt. Brit. Nature Printed*, t. 46 A. fig. 4. *Deakin, Florigr. Brit.* iv. 84, fig. *a*.
CYSTOPTERIS FRAGILIS, *Kunze, Linnæa*, ix. 97, according to Hooker; *Id., Lin.* x. 551.
CYSTOPTERIS DENTATA, *Desvaux, Prod.* 263. *Hooker, Brit. Fl.* 1 ed. 445. *Link, Fil. Sp.* 45. *Fée, Gen. Fil.* 299. *Sowerby, Ferns of Gt. Brit.* 38, t. 21. *Babington, Man. Brit. Bot.* 4 ed. 424.
CYSTOPTERIS PONTEDERÆ, *Link, Fil. Sp.* 45, in obs.
CYSTOPTERIS JAMAICENSIS, *Desvaux, Prod.* 263.
CYSTOPTERIS FUMARIOIDES, *Kunze, Linnæa*, ix. 97. *Fée, Gen. Fil.* 299.

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CYSTOPTERIS RETUSA, *Decaisne, Jacquem. Voy. dans l' Ind.* 176, t. 177.
CYSTOPTERIS CHILENSIS, and C. FRAGILIS, *v.* CHILENSIS, *Fée, Gen. Fil.* 299, 300.
POLYPODIUM DENTATUM, *Dickson, Pl. Crypt. Brit.* fasc. iii. 1, t. 7, fig. 1.
POLYPODIUM PONTEDERÆ, *Allioni, Fl. Pedem.* ii. 286. *Swartz, Syn. Fil.* 68. (*Seguier, Pl. Veron. Supp.* t. 1, fig. 2.)
POLYPODIUM TENERRIMUM, *Poiret, Enc. Bot.* v. 536.
ASPIDIUM DENTATUM, *Swartz, Syn. Fil.* 59. *Willdenow, Sp. Plant.* v. 273. *Sprengel, Syst. Veg.* iv. 104.
ASPIDIUM PONTEDERÆ, *Willdenow, Sp. Plant.* v. 237. *Poiret, Enc. Supp.* ii. 518. *Nyman, Syllog. Fl. Europ.* 432.
ASPIDIUM COLOBODON, *Kunze*, "*Coll. Pl. Chil.* i. n. 265;" according to Kunze.
ATHYRIUM PONTEDERÆ, *Desvaux, Prod.* 266.
ATHYRIUM FUMARIOIDES, *Presl, Rel. Hœnk.* i. 39, t. 6, fig. 2.
ATHYRIUM DENTATUM, *Gray, Nat. Arr. Brit. Pl.* ii. 11.
CYATHEA DENTATA, *Smith, Fl. Brit.* iii. 1141; *Id., Eng. Bot.* xxiii. t. 1588.
CYATHEA FRAGILIS, *Roth, Fl. Germ.* iii. 94.
CYSTEA DENTATA, *Smith, Eng. Fl.* 2 ed. iv. 287.
CYCLOPTERIS DENTATA, *Gray, Nat. Arr. Brit. Pl.* in *corrigenda.*

Var. **Dickieana**: pinnæ deflexed, overlapping; pinnules crowded, broad, obtuse, decurrent, very slightly toothed, or bluntly lobed with the lobes scarcely toothed; sori submarginal, distinct. [Plate CII B.]

CYSTOPTERIS FRAGILIS, *v.* DICKIEANA, *Moore, Handb. Brit. Ferns*, 1 ed. 81; 2 ed. 73; 3 ed. 234; *Id., Bot. Gaz.* i. 310; *Id., Ferns of Gt. Brit. Nature Printed*, t. 46 A. fig. 5, 6. *Hooker & Arnott, Brit. Fl.* 7 ed. 587.
CYSTOPTERIS DICKIEANA, *Sim, Gard. Journ.* 1848. 308. *Newman, Phytol.* 1851, *App.* xxvi.; *Id., Hist. Brit. Ferns*, 3 ed. 93. *Houlston & Moore, Gard. Mag. Bot.* iii. 315, with plate. *Lowe, Nat. Hist. Ferns*, vii. t. 33.
CYSTOPTERIS DENTATA, *v.* DICKIEANA, *Babington, Man. Brit. Bot.* 3 ed. 412. *Sowerby, Ferns of Gt. Brit.* 39, t. 22.

Caudex short, tufted, decumbent, slowly spreading, scarcely creeping, *i.e.*, advancing laterally by the successive projection of the fronds, which form a tuft at the extremity; somewhat scaly. *Scales* pale brown, lanceolate. *Fibres* branched, wiry, numerous.

Vernation circinate.

Stipes slender, brittle, readily breaking away from the caudex, dark brown at the base, and there furnished with a few narrow lanceolate scales, paler or green and smooth upwards; terminal and adherent to the caudex.

Fronds from three or four to twelve or eighteen inches in length, erect, herbaceous, dull green, smooth, oblong-lanceolate, bi-pinnate,

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occasionally sub-bipinnate, or rarely tripinnate. *Pinnæ* ovate-lanceolate or oblong-lanceolate, with the pinnules usually distinct, but sometimes more or less decurrent or connected by the wing of the rachis. *Pinnules*, in the more typical forms, ovate at the base of the pinnæ, oblong towards the apex, generally acute but sometimes bluntish; the larger ones deeply pinnatifid, with oblong toothed lobes, the smaller ones inciso-dentate or more shallowly toothed, the teeth generally acute.

Venation of the larger pinnules consisting of a flexuous *costa* or midvein, from which a branch or *vein* proceeds along each lobe, giving off secondary branches or *venules*, mostly simple, one of which proceeds to the tip of each marginal tooth. The smaller *pinnules* more or less resemble the larger of these lobes, and are also similar as regards their venation.

Fructification scattered over the whole back of the frond. *Sori* numerous, roundish, indusiate, medial on the veins and borne on nearly all their branches in fully fructified fronds, and hence in the more divided forms appearing to be scattered without order over the whole surface, but in the less divided forms, and often in the lobes of the larger ones, they are more evidently placed in a line towards the margin; in the more typical forms they are situated nearer the midrib than the margin, and often in age become confluent. *Indusium* a smooth delicate hooded membrane, attached behind the sorus, either truncate and thus roundish, or prolonged at the point and thus acutely or acuminately ovate; at first they are inflected forwards over the spore-cases, but they soon become reflexed and shrivelled; the anterior margin is entire, or split into narrow segments. *Spore-cases* roundish obovate. *Spores* round or oblong, strongly echinate.

Duration. The caudex is perennial. The fronds are annual, appearing in April or May, and quickly arriving at maturity; these are followed by others in succession through the summer. The fronds are destroyed by the early frosts of autumn.

When viewed as a collective species, and it cannot be satisfactorily viewed in any other light, this Fern is easily recognised by its small slender fragile bipinnate oblong-lanceolate fronds, and the peculiar hooded or semi-calyciform indusia, which in the early stages of

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the fructification may be seen lying hood-like over the roundish masses of spore-cases. It is a plant so polymorphous in character that the species which botanists have from time to time endeavoured to separate from it, though sometimes assuming a distinct-looking aspect, appear in other cases to become united by intermediate forms, and are then with difficulty defined even as varieties. *Cystopteris fragilis* must indeed be considered as being, like the still more polymorphous *Athyrium Filix-fœmina* and *Lastrea dilatata*, a botanical *ignis fatuus*, alluring the incautious novelty-seeker among the quagmires of species-making, in which, at length when his mental vision becomes cleared by more extended observations, he finds himself hopelessly floundering.

This small and elegant herbaceous annual-fronded species is widely distributed, occurring here and there over the whole of Great Britain. It is most abundant among the hills and mountainous tracts of the north of England and of Wales; and becomes somewhat rare in the south and south-eastern parts of the island. It is found however, in the extreme south of England, and extends in Scotland northwards to the Hebrides and the county of Sutherland, ascending, in the east Highlands, to an elevation of more than 3000 feet above the sea. It generally occurs growing in the fissures of moist shady rocks, or of masonry. In Ireland, though here and there abundant, it seems less generally distributed. The chief recorded habitats are as follows:—

Peninsula.—Devonshire: Exwick, near Exeter; since reported to be only a seedling of *Athyrium Filix-fœmina;* near Ilfracombe, *Rev. J. M. Chanter;* limestone rocks near Torquay, very rare. Somersetshire: Cheddar Cliffs, *Sir W. C. Trevelyan, Bart.;* Hampton Cliffs, Bath, *R. Withers*, &c.; abundant.

Channel.—Dorsetshire. Wiltshire: Box Quarries, abundant, *E. Newman.* Sussex: Tunbridge Wells.

Thames.—Surrey: Albury, *T. M.*

Ouse.—Suffolk: Yoxford; Bungay, *D. Stock.* Norfolk, *S. P. Woodcard.* Northamptonshire.

Severn.—Warwickshire: near Arbury Hall; Leamington, *Dr.*

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Allchin; Compton Verney, *D. Cameron.* Gloucestershire: near Bristol; near Hyde; Minchinhampton, *Mrs. Campbell,* &c. Monmouthshire: Pen-y-garn, near Pont-y-pool, and on Mynydd-maen, *T. H. Thomas;* Skirrid Vawr, near Abergavenny; Wyndcliff woods, *W. H. Purchas.* Herefordshire: Downton, *E. Lees;* The Dowards on the Wye. Worcestershire: Breedon hill, *E. Lees;* Bromsgrove. Staffordshire: abundant, *E. Newman;* Ecton Tor, *Rev. A. Bloxam.* Shropshire: Blodwell rocks; Whitcliff near Ludlow, *Mr. Westcott;* by the Teme, near Downton Castle, *E. Lees.*

Trent.—Leicestershire. Nottinghamshire: Oxton and Bulwell Churches, *J. E. Sidebotham;* Worksop. Derbyshire: Dovedale; Matlock, *Dr. Howitt;* Peverel's Castle, Peak's Hole, and Castleton; Lover's Leap near Buxton.

Mersey.—Cheshire: Rostherne Church, *W. Wilson.* Lancashire: Burnley near Colne, *S. Gibson;* near Lancaster, *J. Bell.*

Humber.—Yorkshire: about Settle, *J. Tatham;* Rivaulx Abbey; Beckdale, Helmsley Blackmoor (form approaching *decurrens*), *A. Clapham;* Egglestone bridge on the Greta, *T. Simpson;* near Richmond, *J. Ward;* Dropping Well, Knaresborough; Anston rocks near Sheffield; Castle Howard Park; Halifax; Aysgarth Bridge, Wensleydale; Bradford, *J. T. Newboult;* and other parts.

Tyne.—Durham: Cauldron Snout, &c. Northumberland: Haltwhistle; Mitford Church near Morpeth; Linhope, on the Cheviot Range, *Rev. R. Taylor.*

Lakes.—Cumberland: Lamplugh, *J. Dickenson;* Borrowdale, *Miss Wright;* Holm Rock; Mickledore; Braithwaite Brow, Egremont, *J. Robson;* near Penrith; and elsewhere abundant throughout the lake district. Westmoreland: Kendal; Ambleside, *G. B. Wollaston;* Fairfield; Windermere, *F. Clowes;* and other parts. N. Lancashire: Silverdale.

S. Wales.—Radnorshire. Brecknockshire: Brecon, *E. Williams.* Glamorganshire: Pont-nedd-Vechn, &c.; abundant. Cardiganshire.

N. Wales.—Anglesea. Denbighshire: Llangollen; near Wrexham, *J. E. Bowman;* Ruthin, *T. Pritchard.* Flintshire: Castle Dinas. Montgomeryshire: Craig Breiddin, *Rev. W. A. Leighton.* Merionethshire: Barmouth. Carnarvonshire: Llanberris; Cwm-

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Idwal, Clogwyn-y-Garnedd, Penmaen Mawr; cave at Clogwyn Coch and elsewhere, in the Snowdon district.

W. Lowlands.—Dumfries-shire: near Hobb's Linn, Moffat Dale, *P. Gray.* ? Kirkcudbrightshire. Lanarkshire; Calderwood, *T. B. Bell.*

E. Lowlands.—Berwickshire: Coldstream; near Mains, *Rev. A. Baird.* Edinburghshire: Pentland Hills, *E. Young*, and elsewhere. Linlithgowshire: Woodcock Dale Wood, *Dr. Balfour.*

E. Highlands.—Stirlingshire: Stirling, *Mrs Macleod;* Campsie Glen, *W. Gourlie;* Banks of Loch Lomond. Clackmannanshire: Castle Campbell, near Dollar. Fifeshire: near Wemyss Castle. Perthshire: Den of Balthayoch, *W. Gardiner;* Glen Queich in the Ochils; Pass of Killiecrankie; Killin, *W. Wilson;* Ben Lawers. Forfarshire: Glen Clova; Glen Isla. Kincardineshire coast. Aberdeenshire: Braemar, and elsewhere. Nairnshire: Cawdor Castle. E. Inverness-shire: Kingussie, and elsewhere. Morayshire: *Rev. G. Gordon.*

W. Highlands.—Inverness-shire: Ben Nevis. Argyleshire: Glen Croe, *T. M.;* Oban; Dalmally, near Loch Awe, *Miss Brownlow;* Dunoon. Dumbartonshire.

N. Highlands.—Ross-shire: Coul, *J. Fraser.* Sutherlandshire, *Dr. Murray.* Caithness: Morven, *T. Anderson.*

N. Isles.—Orkney.

W. Isles.—Langa, Harris, *Dr. Balfour.*

Ulster.—Antrim: near Belfast; Woodburn Glen; Carrickfergus. Down: Black Mountain, above Tollymore Park, *Mr. Thompson.*

Connaught.—Leitrim: Manor Hamilton, *R. Barrington;* Glen Car, *R. B.* Galway: Gort, *J. R. Kinahan;* Connemara. Sligo: near the town of Sligo, in profusion, *E. Newman.*

Leinster.—Wicklow (*Newman*). "Though recorded from Wicklow and Dublin, careful research in this latter locality and in many parts of Wicklow has been unrewarded. I have never found it except in the west and north-west where it is tolerably abundant." *J. R. Kinahan.*

Munster.—Kerry: Brandon Hill (3150 ft.), *Mr. Woodward;* cliffs above the Punchbowl, Mangerton. (2500 ft.). Clare: Burren, *J. R. Kinahan;* Black Head, *R. Barrington;* Ballyvaughan, *Dr. Allchin.* Cork, *Newman.*

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In some or other of its many forms, this fern is dispersed widely over the world. It occurs throughout Europe, from Iceland and Lapland through Norway, Sweden, Russia, Denmark, Holland, Belgium, Germany, Switzerland, France, Spain, Portugal, Italy, Dalmatia, Croatia, Hungary, and Transylvania, to Greece, Turkey, the Crimea, and the Russo-Caucasian provinces. In Asia, it is found in the regions of the Ural, the Altai, and Lake Baikal in Siberia, extending to the frontiers of Chinese Turkestan, Kamtschatka and Unalaschka; also in Asia Minor, Erzeroum, Koordistan, and northern Persia; in Affghanistan, Kashmir, Kunawar, Simla, Nepal, Thibet, and the Himalayas. In Africa, we have records of its occurrence in Abyssinia, and at the Cape of Good Hope, as well as in North Africa; and it is found in the islands of Madeira, Teneriffe, the Canaries, and the Azores. Over these north-African islands extending to Malaga, is also dispersed a plant (*sempervirens*) which in its evergreen habit, tough stipites, and hairy indusia, has strong claims to specific rank. In America the species extends from Greenland, Labrador, Kotzebue's Sound, and the countries bordering the Polar Sea, through north-west America, to Canada, the United States, California, Mexico, Guatemala, and Columbia: in the latter warmer countries becoming the var. *nigrescens* of Hooker. At Xalapa, as well as in Guatemala, and Quito, and on the Andes of Peru, also occurs a peculiar slender narrow form of the *dentata* series. The plant is again found in the West Indies: Jamaica, Cuba, and the Bahamas; and in America, in New Grenada; in Chili, at Mendoza, and at Port Famine. *C. fragilis* has also been recorded from Tasmania. Many of the reputed habitats of the central parts of North America belong to *C. tenuis*, a species which, though perhaps not distinguishable by its fronds alone from some forms of *C. fragilis*, is totally different in habit, having a widely-creeping rhizome.

This is a pretty little Fern for the cultivator, affording in its different forms some variety in his collection, and thriving well either in cool frames or greenhouses planted in pots, or on the open rock-work in shady and somewhat moist localities which enjoy a moderately pure atmosphere. The soil may be composed of light

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turfy peat and loam, with sand, in equal parts. It does not require pots of large size, and the drainage should be ample. Few Ferns are more easily cultivated than this, for although growing more luxuriantly when planted in prepared soil and in a situation corresponding to its natural habitat, yet it does not refuse to grow in any ordinarily good earth, provided it is porous and well drained. Mr. Johnson observes that it may be grown in the open border, and if not too fully exposed to the sun, forms beautiful and elegant tufts that contrast well with the smaller species of herbaceous plants, requiring only the occasional removal of its rapidly maturing fronds to maintain throughout the summer the lively green appearance of the masses. The delicate feathery character of the foliage, he continues, renders it a favourite species for pot culture, and in a cool greenhouse it becomes highly ornamental; but it is not well adapted for planting in closed cases, though often recommended, the slender rachis being too rapidly extended in the damp confined atmosphere to support the lengthened frond. All the British forms of this *Cystopteris*, are seen under cultivation to the greatest advantage when planted on shaded rock-work. Like other rock and wall plants, they require good drainage, a condition readily effected by the admixture of about one-fourth of small fragments of old mortar with the soil or compost employed. The value of this addition is indicated by the natural preference the species seems to evince for limestone districts. The plants increase readily by division, or from the spores.

The fronds of this Fern, and of some others of similar texture, are frequently damaged by the ravages of a yellow fungus (*Uredo filicum*), which spreads rapidly and soon spoils those plants which are seriously attacked. It occurs most commonly on plants grown in houses, and might hence be supposed to be owing to the confined dampness generally maintained in structures where Ferns are grown; but this is not the case, for we have found native specimens from Ben Lawers and from Ireland similarly affected.

There are no very definite limits to the variations of this species, even when exotic forms are excluded, except in the case of the variety *Dickieana* which is well-marked and permanent; still there

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are some forms which may be conveniently associated and distinguished by names, and certain plants referred to these are constant under cultivation, though perhaps variable forms are sometimes wrongly associated with them. The most remarkable variations are the following :—

1. *angustata* (Smith). The variety to which this name has been given is one of the taller forms of the species. According to Sir J. E. Smith it is the same as the *Polypodium rhæticum* of Dickson and of Bolton (*Fil. Brit.* t. 45). This plant of Dickson's has slender fronds nearly or quite a foot high, and almost caudate at the apex; it is bipinnate; the pinnæ end in a long taper point; the pinnules are generally oblong-lanceolate acute, the lowest only being somewhat acutely ovate, and the larger ones are deeply lobed with sharp-toothed segments, the smaller ones acutely toothed. What appears to be the same form is sometimes more vigorous, and then the pinnules are larger, broader, and divided into secondary pinnules resembling the lesser primary ones of Dickson's plant; the margin is always acutely toothed, and we include those forms in which the edges of the smaller pinnules, and of the lobes of the larger ones, are deeply and rather evenly incised into conspicuous longish narrow teeth. The spores in Dickson's plant are roundish and echinate. Mr. Wollaston and others think it is not very constant, and probably the name may have been given to some plants which have reverted under culture to the ordinary state; but we have seen others somewhat smaller indeed than Smith's description seems to point out, but otherwise according with it, which are quite permanent under pot-culture in a cool fern house. Those to which we refer are more narrowed and elongated in the frond and the pinnæ than the usual form, the points being as it were drawn out, and the pinnules are generally oblong and somewhat decurrent: these being its chief characteristics. [Plate CII C.]

Besides Dickson's plant, said to be from "Shadow Rocks" in Scotland, we refer here specimens from the following habitats :—

Peninsula.—Devonshire: Marwood, *Rev. F. Mules.*
Trent.—Derbyshire: Matlock; Castleton, *W. Christy.*

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Humber.—Yorkshire: Settle; also rather broader and somewhat irregular, *A. Clapham;* Wensleydale; Gordale, Craven.

Lakes.—Cumberland: *F. Clowes.* Westmorland: Whitbarrow, *F. C. N. Wales.*—Carnarvonshire: Llanberris, *Lhwyd;* also a very slender form, *J. Atkins.*

E. Lowlands.—Edinburghshire: Pentland Hills.

E. Highlands.—Perthshire: Ben Lawers, *T. M.*

Connaught.—Sligo: Lough Gill, *R. Barrington.*

2. *obtusa* (M.). This is a distinct and constant form under cultivation. The fronds are dark green, nearly or quite a foot in height, and of a lanceolate form; they are peculiar from their short blunt ovate or roundish-ovate narrowly and shortly stalked pinnules, which are deeply pinnatifid into blunt oblong lobes, notched with small narrow but bluntish teeth, which are sometimes very evident; the spores are echinate. It was found in Scotland by Mr. A. Tait. We refer here specimens from—Yorkshire: Newton Vale near Whitby, *A. Clapham.* Westmoreland: Kentmere, *F. Clowes;* Whitbarrow, *G. B. W.* Cumberland: Borrowdale, *G. B. Wollaston.* Carnarvonshire: Llyn Ogwen, *S. O. Gray.*

3. *dentata* (Hook.). The fronds of this elegant form are usually of small size, four to eight inches long, narrowish, bipinnate, or with more or less confluent pinnules, so that the narrow fronds are sometimes scarcely bipinnate; these pinnules are blunt oblong, blunt-toothed, or obscurely blunt-lobed, and the sori are placed near their margin, the centre of the pinnule being clear. Somewhat larger and more deeply lobed forms, having the same aspect, are met with, and through these it gradually merges into *obtusa*, and thence into the normal state. There are some of the cultivated forms of this variety that are certainly constant, though it is probable from its being often looked on as inconstant, that accidentally blunt-pinnuled plants of the common form are sometimes associated with it. The spores are echinate, but scarcely in so marked a degree as they are in the more typical forms of the species. [Plate CII A.]

This variety has been met with in the following habitats:—

Peninsula.—Somersetshire: Cheddar.

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Channel.—Wiltshire: Box Quarries, *Dr. Alexander.*

Thames.—Surrey: Albury, *T. M.*

Severn.—Warwickshire: Arbury. Monmouthshire: Pen-y-garn near Pont-y-pool, and on Mynydd-maen, *T. H. Thomas;* Skirrid Vawr near Abergavenny. Herefordshire: The Dowards on the Wye. Staffordshire: Ecton Tor, *Rev. A. Bloxam.*

Trent.—Derbyshire: Dovedale, *S. Buckland;* Matlock Baths.

Mersey.—Cheshire. Lancashire.

Humber.—Yorkshire: Settle; Wensleydale, *C. H. Compton.*

Tyne.—Durham: Cauldron Snout. Northumberland: Linhope, Cheviot Range, *Rev. R. Taylor;* Mitford Church, near Morpeth.

Lakes.—Cumberland: Borrowdale, *Miss Wright;* Egremont, *J. Robson;* Ullswater, *G. B. Wollaston.* Westmoreland: Kendal; Windermere, *F. Clowes;* Arnside Knot, *H. D. Geldart;* Fairfield near Ambleside. N. Lancashire: Silverdale.

S. Wales.—Glamorganshire: Pont-nedd-Vechn; Abergavenny, *E. Lees;* Glyn Neath, *E. Lees.* Brecknockshire: Brecon, *E. Williams.*

N. Wales.—Anglesea, *Rev. H. Davies.* Denbighshire: Llangollen; near Wrexham; Ruthin, *T. Pritchard.* Flintshire: Castle Dinas Bran, *H. Shepherd.* Montgomeryshire: Craig Breidden, *Rev. W. A. Leighton.* Carnarvonshire: Llanberris; precipices of the highest peak of Snowdon, *R. Barrington;* Penmaen Mawr, &c.

W. Lowlands.—Dumfries-shire: Moffat Dale, *P. Gray.* Kirkcudbrightshire: Cluden Hills (formerly), *P. Gray.*

E. Lowlands.—Linlithgowshire: Woodcock Dale Wood, *Dr. Balfour.*

E. Highlands.—Stirlingshire: banks of Loch Lomond. Forfarshire: Glen Isla, *H. M. Balfour.* Perthshire: Ben Lawers, *T. M.* Inverness-shire: Kingussie. Aberdeenshire: Braemar, *A. Croall.*

W. Highlands.—W. Inverness-shire: Ben Nevis.

N. Highlands.—Caithness: Morven, *T. Anderson.*

N. Isles.—Orkney: Hoy, *T. Anderson.*

Ulster.—Antrim: rocks at Carrickfergus, *Mr. Templeton.* Donegal, *R. Barrington.*

4. *decurrens* (M.). This form is intermediate in aspect and character between *dentata* and *Dickieana*, approaching the latter in having the pinnæ deflexed, and the pinnules decurrent, but differing

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in the more acute apices of the fronds and pinnæ, and in the more prominent toothing, which rather resembles that of the former, as does the colour and texture. The spores are echinate. It was found by Mr. Tait, of Edinburgh, at Silver Cove, near Wemyss Castle, on the coast of Fifeshire. [Plate CII D.]

5. *Dickieana* (M.). This is the most decided variety yet known, but though distinct in appearance it is nevertheless connected with *fragilis*, through *decurrens* and *dentata*, and therefore, can only be considered a variety. Its chief peculiarities consist in the pinnæ being deflexed, and more or less overlapping, and in the broad short obtuse bluntly-toothed pinnules being crowded and overlapping, and all connected by the wing of the rachis with which they are decurrent. The fronds are of a bright deep green, often scarcely bipinnate, from the pinnæ and upper pinnules being confluent; the pinnæ are ovate-lanceolate somewhat twisted round, the lower margin being elevated; the pinnules are mostly decurrent, sometimes much so, broad oblong, or oblong ovate, obtuse, having but a few shallow blunt marginal notches, imbricated. In the more highly developed of the fertile fronds the lobes of the pinnules, though blunt, become more distinct, and they have then blunt inconspicuous teeth. The sori are situated very near the margin; and the spores are slightly verrucate or tuberculate, not echinate-tuberculate as in the other varieties, a fact, we believe, first pointed out by Mr. Wollaston. The twisting of the pinnæ from the plane of the frond, such as occurs in some degree in *dentata*, the deflexion of the pinnæ and the frequent confluence of the pinnules, produce a peculiar aspect, by which this variety is known at a glance. The plant was first found by Dr. Dickie on dripping rocks in a cave at Cove, near Aberdeen, and it has since been gathered beneath micaceous rocks about two miles east of Cove, towards Lighthouse Point, by the late Mr. C. Barter, and by Dr. Balfour, near Dunkeld. The plant has also been gathered by Mr. G. Maw, in the Cove habitat; and that gentleman informs us that some fronds brought from the Great Isle of Arran in Galway by Mr. D. Moore of Glasnevin, appear to be identical with it. In cultivation this variety has sometimes produced fronds or pinnæ with the apice multifid or forked. [Plate CII B.]

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6. *furcans* (M.). In this form the apices of the pinnæ are more or less uniformly forked, with the points spread apart; sometimes they are twice forked, and usually there is a slight irregularity in the development of the pinnules; in some of the pinnæ the apex is spread out into five points. The general character of the fronds otherwise resembles *dentata*. This plant was found at Killin in Perthshire by Mr. S. O. Gray; and a similar form communicated by Messrs. Stansfield of Todmorden, has been found in the Clova Mountains.

7. *interrupta* (Woll.). This is a curious monstrous form, and quite permanent. The fronds are dissimilar, but from the altered or interrupted or contracted state of the pinnæ, they are all more or less narrowed, and are very frequently nearly linear throughout, or for the greater part of their length. The pinnæ where normal resemble *dentata*, but are usually shorter and more confluent; they are however sometimes reduced to small fan-shaped or three-lobed bodies, and where this occurs in a continuous manner along the rachis, the frond becomes narrow-linear. Sometimes the pinnæ consist of two to four or six very unequal and irregular pinnules, which are often fan-shaped, and then the fronds have a narrow but irregular contracted outline. The pinnules in the interrupted portions are variously truncated laciniated or depauperated, or sometimes bifid or multifid. It was found in Westmoreland by Mr. I. Hudhart, and was distributed by Mr. F. Clowes. [Plate CII E.—Folio ed. t. XLVI A. fig. 7.]

(8.) *sempervirens* (M.). There is another form reputed to have been found both in Devonshire and Kent, which has several distinctive features, namely:—the fronds are of evergreen character under shelter, the plants kept in a cold greenhouse continuing to grow in succession through the whole winter, when all other forms of *Cystopteris* known in cultivation are quite dormant; the stipites are stout, pallid, not brittle but tough, so much so that they are not easily broken asunder; the anterior basal pinnules are larger than the posterior ones; and the surface of the indusium is clothed with glandular hairs, which are conspicuous in the fresh plant. This evergreen species, for such we believe it to be, has, in addition, a short creeping rhizome, vigorous fronds of narrow lanceolate outline,

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and distinct, ovate bluntish or sometimes acute pinnules, of which the larger are often nearly or quite again pinnate, the lobes blunt, and bluntly or sometimes acutely toothed. The spores are irregularly roundish oblong, muricate. There are some doubts as to the English origin of this plant, but of its distinctness either as a variety, or as a species,* none. Bolton figures (*Fil. Brit.* t. 45), under the name of *Polypodium rhæticum*, a facsimile of moderate sized specimens, and he describes two of its prominent characteristics; namely, the tough stipites, and the larger anterior pinnules. If, therefore, his statement is conclusive, (which may be open to doubt, as his figure is generally taken to represent the larger growth of the var. *angustata*,) it is a native of Scotland. It is certainly a native of Madeira. The reputed British plant has been found at Tunbridge Wells, and is in cultivation from this source, but there are rumours of its having been planted there; it is further stated to have been found in Devonshire, but this also is open to suspicion, the garden whence it has been distributed having been enriched by importations from Madeira. Whether the *C. canariensis* of Presl, be the plant here indicated, there appears no means of determining, without access to the Berlin herbaria, as there is no published definition or character of the plant; and the same may be said of the *C. azorica* of Fée. In the mean time we direct attention to its existence, and point out that it is quite permanent as to its characters.

* If regarded as a species, it might well bear the name of *C. sempervirens*.

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THE ALPINE BLADDER FERN.

CYSTOPTERIS REGIA.

C. fronds lanceolate, bi-sub-tripinnate; pinnæ ovate; pinnules ovate-oblong, united by a wing, deeply pinnatifid, the lobes linear or linear-oblong, with two or three short blunt or retuse teeth; rachis winged above; veins terminating in the apical notch of the emarginate teeth. [Plate CIII.]

CYSTOPTERIS REGIA, *Desvaux, Prod.* 264. *Presl, Tent. Pterid.* 93. *Fée, Gen. Fil.* 299. *Moore, Handb. Brit. Ferns,* 3 ed. 242; *Id., Ferns of Gt. Brit. Nature Printed,* t. 46 B. *Lowe, Nat. Hist. Ferns,* vii. t. 30.

CYSTOPTERIS ALPINA, *Desvaux, Prod.* 264. *Link, Hort. Reg. Berol.* ii. 130; *Id., Fil. Sp.* 46 (incl. var. *regia*). *Hooker, Brit. Fl.* 1 ed. 446; *Id., Sp. Fil.* i. 199. *Hooker & Arnott, Brit. Fl.* 7 ed. 587. *Bentham, Handb. Brit. Pl.* 636. *Babington, Man. Brit. Bot.* 4 ed. 424. *Moore, Handb. Brit. Ferns,* 2 ed. 78. *Sowerby, Ferns of Great Britain,* 40, t. 23. *Mettenius, Fil. Hort. Bot. Lips.* 97.

CYSTOPTERIS REGIA, β. ALPINA, *Koch, Syn.* 2 ed. 980.

POLYPODIUM REGIUM, *Linnæus, Sp. Plant.* 1553. *Poiret, Enc. Bot.* v. 538.

POLYPODIUM ALBUM, β. *Lamarck, Fl. Franç.* i. 21.

POLYPODIUM POLYMORPHUM, (c) REGIUM, *Villars, Hist. Pl. Dauph.* iii. 847, t. 53, fig. C.

POLYPODIUM ALPINUM, *Wulfen, Jacq. Collect.* ii. 171. *Jacquin, Icon. Plant. Rar.* iii. t. 642. *Poiret, Enc. Bot.* v. 540.

POLYPODIUM CRISPUM, *Gouan, Illust. Bot.* 81.

ASPIDIUM REGIUM, *Swartz, Schrad. Journ. Bot.* 1800, ii. 41; *Id., Syn. Fil.* 58. *Willdenow, Sp. Plant.* v. 281. *Sprengel, Syst. Veg.* iv. 107. *Nyman, Syllog. Fl. Europ.* 432.

ASPIDIUM ALPINUM, *Swartz, Schrad. Journ. Bot.* 1800, ii. 42; *Id., Syn. Fil.* 60. *Willdenow, Sp. Plant.* v. 282. *Schkuhr, Krypt. Gew.* 60, tt. 62, 62 *b*. *Sprengel, Syst. Veg.* iv. 109. *Sturm, Fl.* (Farrn.) t. 5.

ASPIDIUM TAYGETENSE, *Bory & Chaubard, Fl. Pelop.* 288, in part.

CYATHEA INCISA, *Smith, Eng. Bot.* iii. t. 163.

CYATHEA REGIA, *Forster, Symon's Syn. Plant.* 194. *Smith, Fl. Brit.* iii. 1140, in part.

CYATHEA ALPINA, *Smith, Mem. Acad. Roy. Turin,* v. 417, in obs. *Roth, Fl. Germ.* iii. 99.

CYSTEA REGIA, *Smith Eng. Fl.* 2 ed. iv. 289 (excl. syn. Withering, and the alpine habitats).

CYSTEA ALPINA, *Smith, Eng. Fl.* 2 ed. iv. 291, in obs.

ATHYRIUM ALPINUM, *Röhling;* according to Steudel.

ATHYRIUM REGIUM, *Sprengel, Anl.* iii. (1804) 139. *Gray, Nat. Arr. Brit. Pl.* ii. 11 (excl. syn. Withering).

! ASPLENIUM ALPINUM, *Poiret, Enc. Supp.* ii. 516, in obs.

CYCLOPTERIS REGIA, *Gray, Nat. Arr. Brit. Pl.* ii. *in corrigenda.*

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Caudex short, decumbent, spreading, tufted, the crown sparingly furnished with a few very narrow pale brown scales. *Fibres* numerous, branched, wiry.

Vernation circinate.

Stipes slender, brittle, variable in length, sometimes quite short, sometimes one-third to one-half the length of the frond, pale-coloured except at the base which is brownish; terminal and adherent to the caudex. *Secondary rachis* narrowly margined.

Fronds three to six or eight inches long, herbaceous, bright pale green, erect, smooth, lanceolate, bipinnate, or almost tripinnate in luxuriant fronds. *Pinnæ* ovate, acute, unequal. *Pinnules* bluntly or sometimes acutely ovate, with a narrow stalk-like attachment, deeply pinnatifid; the lobes linear or linear-oblong, blunt, obscurely toothed, or sometimes with short distinct erect teeth which are blunt-pointed or retuse. In the larger pinnules the lobes, though still decurrent, and not truly separate, are distant and nearly divided to the rachis, so that the fronds are almost tripinnate. The fronds are occasionally forked.

Venation of the pinnules consisting of a *costa* or midvein, from which an alternate lateral branch or *vein* is directed into each lobe, and there branches into several *venules*, which terminate in the retuse apices of the teeth; each tooth is thus apparently directed towards a sinus of the margin.

Fructification scattered over the back of the frond. *Sori* numerous, sometimes crowded, small, round, medial on the veins, indusiate. *Indusium* a small delicate transparent membrane, which is ovate acute, slightly jagged in front, attached behind the sorus, projected forwards over it, becoming at length reflexed. *Spore-cases* roundish-obovate. *Spores* oblong, echinate.

Duration. The caudex is perennial. The fronds are annual, appearing in May and perishing in autumn.

The plant found at Leyton is generally admitted to be the *Polypodium regium* of Linnæus, and it is certainly the *P. alpinum* of Wulfen. It seems therefore proper to adopt, as Presl has done, the older specific name; but the specimen in the Linnæan herbarium it must be observed, is not quite satisfactory evidence in support of this view.

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The only authenticated habitat for this plant is a wall at Low Leyton, in Essex, where, at the close of the last century, it existed in such great plenty as to forbid the notion of its being, at that early date, an introduced species. We have elsewhere stated* that Mr. W. Pamplin has told us, he well remembers when a boy, being in company with his father, who drove up to the road-side wall on which the 'rare fern' grew, and at that time the appearance of the plant, still fresh in his memory, was as if parsley had been sown along the wall. This *Cystopteris* does not spread rapidly, and such an appearance, even if somewhat exaggerated by childish inexperience, could only have resulted from its having been long established there. The observation itself must have been made nearly or quite at the beginning of the present century, and the consideration of its quantity at that period would carry back the date to near a century from the present time, so that one naturally inquires, who then cared for or cultivated or could have artificially or accidentally introduced such a plant. Now, when there is such a *furor* for ferns, a European species might become naturalised through the proximity of cultivated specimens, but this was hardly likely to happen in the middle of the last century. The plant is at the present time, unfortunately, nearly destroyed by repairs, though it exists in more than one station in the neighbourhood. We have received authentic specimens of this species, said to have been gathered in Derbyshire and in Yorkshire, but without more particular habitats assigned, from Mr. H. Shepherd. The various alpine British stations which have been reported for this plant probably belong rather to small much-divided forms of *C. fragilis*. We have not seen a native mountain specimen of *C. regia*, unless it be one from Saddleback, in Cumberland, gathered many years since by Mr. S. F. Gray.

This elegant plant is plentiful in many localities in the Alps of Switzerland, Carinthia, Styria, &c. It is also said to occur in Sweden, in Belgium, in France, Spain, and Italy, in Dalmatia, Croatia, Hungary, and Transylvania; in Greece on Mount Taygetus, in the Morea, and on Mount Athos in the peninsula of Chalcis. It also occurs on Mount Taurus in Asia Minor.

* Moore, *Hooker's Kew Journal of Botany*, viii. 25.

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There is no doubt that this is a species distinct from *C. fragilis*. It is analogous in size with the smaller forms of the latter, but is more finely divided; the segments of its pinnules are either narrow-oblong or linear; and the teeth are either blunt or more commonly emarginate. The veins very frequently terminate in the notch at the apex of the tooth, instead of the projecting point of the tooth, as is the case in *C. fragilis*.

The present is an easily grown plant, either in well-drained pots of free open soil, such as light loam and turfy peat mixed with sand, or in well-drained sheltered situations, in open rockeries if the soil is made congenial. It is more liable than the commoner species to suffer from damp while at rest in winter, and hence water should not be allowed to collect about it at that season. There is no other difficulty in cultivating it, and it forms an elegant small pot fern, increased with facility by division.

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THE MOUNTAIN BLADDER FERN.

CYSTOPTERIS MONTANA.

C. fronds triangular, tripinnate; pinnæ spreading; pinnules ovate or oblong, inciso-dentate or pinnatifid; the lobes obtusely subfalcate, toothed at the apex; caudex creeping. [Plate CIV.]

CYSTOPTERIS MONTANA, *Bernhardi, Schrad. neues Journ. Bot.* 1806, i. part 2, 26. *Link, Hort. Reg. Berol.* ii. 231; *Id., Fil. Sp.* 47. *Presl, Tent. Pterid.* 93. *Hooker, Sp. Fil.* i. 200. *Hooker & Arnott, Brit. Fl.* 7 ed. 587. *Deakin, Florigr. Brit.* iv. 88, fig. 1601. *Newman, Hist. Brit. Ferns,* 2 ed. 159. *Babington, Man. Brit. Bot.* 4 ed. 424. *Moore, Handb. Brit. Ferns,* 3 ed. 244; *Id., Ferns of Gt. Brit. Nature Printed,* t. 46 C. *Bentham, Handb. Brit. Fl.* 637. *Sowerby, Ferns of Gt. Brit.* 41, t. 24. *Fée, Gen. Fil.* 299. *Koch, Syn.* 2 ed. 981. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 517. *Lowe, Nat. Hist. Ferns,* vii. t. 34.

CYSTOPTERIS ALLIONI, *Newman, Phytol.* 1851, *App.* xxv.

CYSTOPTERIS MYRRHIDIFOLIA, *Newman, Hist. Brit. Ferns,* 3 ed. 97.

POLYPODIUM MONTANUM, *Lamarck, Fl. Franç.* i. 23 (1778). *Allioni, Fl. Pedem.* ii. 287 (1785). *Hœnke, Jacq. Collect.* ii. 46. *Svensk Bot.* t. 666. *Poiret, Encyc. Bot.* v. 539 (excl. A).

POLYPODIUM MYRRHIDIFOLIUM, *Villars, Fl. Delph.* 114 (1785); *Id., Hist. Pl. Dauph.* i. 292 (1786); iii. 851, t. 53 (1789).

ASPIDIUM MONTANUM, *Swartz, Schrad. Journ. Bot.* 1800, ii. 42; *Id., Syn. Fil.* 61. *Schkuhr, Krypt. Gew.* 61, t. 63. *Willdenow, Sp. Plant.* v. 286. *Sprengel, Syst. Veg.* iv. 109. *Flora Danica,* t. 2250. *Nyman, Syllog. Fl. Europ.* 431.

ATHYRIUM MONTANUM, *Röhling;* according to Steudel.

CYATHEA MONTANA, *Smith, Mem. Acad. Roy. Sc. Turin,* v. 417. *Roth, Fl. Germ.* iii. 100.

Caudex creeping, about as thick as a crow's quill, producing the fronds at irregular intervals, almost black, with a few scattered ovate scales on the younger portions. *Fibres* branched, rigid.

Vernation circinate.

Stipes lateral and adherent to the rhizome, slender, longer than the frond, often twice as long, dark-brownish-purple at the base, paler upwards, sparingly furnished especially near the base with ovate-lanceolate scales. *Rachis* narrowly margined above, and together with the secondary rachides, which are also margined, sometimes tinged with purple.

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Fronds herbaceous, deep-green, smooth, triangular, tripinnate, four to twelve inches high including the stipites, the leafy portion being about three or four inches long, and the same in breadth. *Pinnæ* unequal, ascending, the lower pair considerably largest, two inches and a half long, obliquely ovate, the posterior pinnules twice as long as the anterior ones; the next pinnæ are also unequal-sided, the posterior pinnules being largest, but this difference becomes less manifest upwards. *Pinnules* (the larger posterior ones) ovate, pinnate; the smaller upper ones pinnatifid. The basal *pinnulets* of the larger pinnules are ovate with a distinct narrowed stalk-like attachment, but connected by a narrow wing, pinnatifid, with oblong-ovate obtuse lobes, which are cut into linear teeth, the teeth generally bifid at the extremity. In its ultimate divisions this species is thus very much like *C. regia*.

Venation of the pinnules, consisting of a nearly straight *costa* or midvein, with alternate *veins* directed one into each lobe; a *venule* is given off towards each tooth, and is continued to the margin, where it is lost in the sinus formed by the bifid apex of the tooth, thus ending in a depression rather than a projection of the margin.

Fructification occupying the whole under surface. *Sori* consisting of numerous moderate sized, roundish masses of spore-cases, medial on the veins, indusiate. *Indusium*, a delicate transparent, concave, subrotund membrane, irregular at the margin, placed at the back of the sorus, and soon obliterated. *Spore-cases* obovate. *Spores* oblong muricate.

Duration. The rhizome is perennial. The fronds are annual; they appear about May, and are renewed at intervals, perishing early in autumn.

This plant is at once known from the other British species of *Cystopteris* by its long creeping caudex, and its triangular and tripinnate fragile fronds. It has much more the aspect of *Polypodium Dryopteris*, for which it might, perhaps, be mistaken, and all the more readily, as its indusia become soon obliterated, and the sori then seem to consist of round naked masses of spore-cases. It is not, however, three-branched, as that is, and is also more divided, as would be seen by a comparison of the fronds.

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This species grows on mica schist in moist alpine situations. It was first found in Great Britain, on Ben Lawers, in Perthshire, by Mr. W. Wilson, in 1836. It has been subsequently met with by the late Mr. W. Gourlie, Dr. Arnott, Mr. W. Borrer, Rev. W. Little, Mr. T. Westcombe, and other botanists, on the mountains dividing Glen Lochy and Glen Dochart, in the same county. The locality is variously described. Mr. Gourlie calls it Corrach Uachdar. Mr. Borrer observes that "the station is recorded under the name of Corrach Uachdar, but a native of the neighbourhood calls the mountains Meal Ouffillach, and the ravine Corrach Dh' Ouffillach, as nearly as I could express his pronunciation:" this station is some miles up the glen, and is described as being on the left hand over against Mael Ghyrdy. Mr. Westcombe could find no one in the district who recognised the foregoing names, but after a diligent search he met with another locality some six or eight miles from where Mr. Borrer had found it. Hooker and Arnott give Meal Cuachlar as a habitat. More recently it has been gathered in the same districts, by Dr. Balfour, and Mr. G. Maw; and also in Canlochen at the head of Glen Isla, Clova, Forfarshire, by Mr. J. Backhouse, to whom we are indebted for specimens. In the Canlochen station, Mr. Backhouse met with it in considerable quantity, and in fine fructification. It is further recorded in the *Naturalist* as having been found, in 1855, on Ben-rinnes (? Belrinnes, a mountain of Banffshire). There is moreover, a statement that this plant has been found in Wales, but the figure of Plukenet referred to in support of this habitat, certainly does not represent the present species, and Mr. Newman appears to have satisfactorily shown that it belongs to some mountain form of Buckler Fern, and probably to *Lastrea æmula.*

This Fern is found in the extreme northern parts of Europe, in Lapland, in the north of Sweden, Norway, and Denmark, thence scattered here and there southwards on the mountain ranges of central and southern Europe, namely in France, Switzerland, Germany, Spain, Italy, and Hungary. According to Ledebour, it is met with in Kamtschatka. It is also found among the Rocky Mountains in North-West America. Another triangular

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fronded species allied to, but distinct from *C. montana*, the *C. sudetica* of Braun and Milde, occurs in Silesia.

This plant has often been found difficult to cultivate, probably on account of the slight information which was for some time to be obtained by cultivators as to the peculiarities of its native habitats. Now, however, that it is known that the long creeping stems thread their way on the ledges of dripping rocks, among beds of sphagnum, less difficulty will be experienced. These natural conditions suggest the employment of a very open medium for the roots, such as light turfy peat and sphagnum intermixed with coarse sand and small fragments of charcoal or freestone. A constant and abundant supply of moisture, so regulated as not to become stagnant, is also requisite. If grown in pots, those of broad shallow form are evidently preferable, and even shallow pans of convenient size may be preferred. These conditions being fulfilled, the plant is found to grow with facility; but it is more remarkable on account of its rarity, than for its beauty. The creeping caudices afford every facility for propagation, when they become established and vigorous. In planting, they should be arranged horizontally on a good layer of the compost, and covered with about an inch thick of the same material. In favourable localities, it grows freely in the open air.

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Genus XIV: **WOODSIA**, *R. Brown.*

Gen. Char.—**Sori** involucrate *i. e.* with inferior indusia, globose; the **receptacles** medial or terminal. **Involucre** soft membranaceous, pateriform and fimbriately crinite, or calyciform with the margin lobed, or subglobose with the mouth contracted. **Veins** simple or forked, or pinnate from a central costa; **venules** free.

Fronds membranaceo-herbaceous, small, pinnate-pinnatifid, or bipinnate.

Caudex tufted, erect or decumbent.

This small genus is found to be very distinct in character when its fructification is rightly understood, although at first sight no very prominent distinction is apparent. It is one of those ferns in which the fructification, dorsal on the frond, and medial on the veins, is punctiform or dot-like; but instead of the sorus being naked as in the *Polypodieæ*, or indusiate as in the *Aspidieæ* and *Cystopterideæ*, it is here involucrate: in other words, instead of the investing membrane being placed over the spore-cases as in the truly indusiate groups, it is here placed beneath them, assuming a more or less cup-shaped or calyciform character. In *Cystopteris* the indusium being concave and attached behind the spore-cases, becomes semi-calyciform, and indicates an approach to the structure observable in *Woodsia;* but the truly calyciform indusia of the latter, keeps it quite distinct from all other British genera. Regarded in this light, *Woodsia* is a very well-marked genus, distinguished by the coincidence of three characteristics:—the presence of an involucre or an involucriform indusium, sessile sori, and free veins.

There are some differences in the nature of the involucre among the species referred to *Woodsia*, and some botanists prefer to separate under distinct generic names the species possessing these peculiarities, but we have preferred to regard the differences, which certainly do exist, rather as modifications of one type of structure,

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than as distinctions of generic importance. In one group, § *Woodsia*, which may be considered typical of the genus, and which is represented by our two native species, the involucres are very small and pateriform (dish-like) with a prominent fringed margin of incurved hair-like segments. In another group, § *Perrinia*, represented by the North American *W. obtusa*, the involucres are larger sub-hemispherical and broken at the edges into four or five irregular lobes. In the § *Physematium*, represented by *W. mollis* of Mexico, the involucres are subglobose, with a contracted mouth at the apex. There is considerable difference of appearance between the two extremes of form here indicated, but they seem sufficiently reconciled by the intermediate group, and *Woodsia* proper may be regarded as having the sub-globose involucre of *Physematium* split at the margin into criniform incurved segments, thus retaining in some measure the cup-shaped character.

The genus *Woodsia* is the British representative of the sectional group *Peranemeæ*, which includes in addition two or three small exotic families.

The generic name is given in compliment to Mr. Joseph Woods, a veteran British botanist.

BRITISH SPECIES.

W. ilvensis: fronds oblong-lanceolate, subulately squamose; pinnæ oblong or ovate-oblong obtuse; stipes and rachis crinite chaffy.

W. alpina: fronds linear, slightly hairy not scaly; pinnæ triangular ovate obtuse; stipes and rachis slightly hairy.

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THE OBLONG WOODSIA.

WOODSIA ILVENSIS.

W. fronds oblong, lanceolate, pinnate, thinly clothed with broadly-subulate chaffy scales beneath; pinnæ oblong, obtuse, deeply pinnatifid, the lobes bluntly ovate or oblong, obtuse; stipes and rachis chaffy-crinite. [Plate CV.]

WOODSIA ILVENSIS, *R. Brown, Trans. Lin. Soc. Lond.* xi. 173 (excl. syn. Michaux). *Smith, Eng. Fl.* 2 ed. iv. 309. *Hooker, Supp. Eng. Bot.* t. 2616; *Id., Sp. Fil.* i. 63. *Deakin, Florigr. Brit.* iv. 45, fig. 1583. *Hooker & Arnott, Brit. Fl.* 7 ed. 583. *Babington, Man. Brit. Bot.* 4 ed. 420, in part. *Sowerby, Ferns of Gt. Brit.* 14, t. 5. *Newman, Hist. Brit. Ferns,* 3 ed. 71. *Moore, Handb. Brit. Ferns,* 3 ed. 248; *Id. Ferns of Gt. Brit. Nature Printed,* t. 47 A. *Bentham, Handb. Brit. Fl.* 637. *Sprengel, Syst. Veg.* iv. 125. *Fée, Gen. Fil.* 338. *Kaulfuss, Enum. Fil.* 251. *Link, Fil. Sp.* 135. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Ross.* iv. 510. *Ruprecht, Dist. Crypt. Ross.* 52. *A. Gray, Bot. N. United St.* 596. *Mettenius, Fil. Hort. Bot. Lips.* 98. *Nyman, Syll. Fl. Europ.* 430. *Lowe, Nat. Hist. Ferns,* vii. t. 28.

WOODSIA VESTITA, *Sprengel, Nov. Prov. Hal.* 44 (excl. syn.) according to Kaulfuss.

WOODSIA RAIANA, *Newman, Hist. Brit. Ferns,* 2 ed. 140.

WOODSIA RUFIDULA, *Beck, Bot. North. & Midd. States,* 452.

WOODSIA PALEACEA, *Opiz;* according to Steudel.

WOODSIA HYPERBOREA, β. RUFIDULA, *Koch, Syn.* 2 ed. 975.

ACROSTICHUM ILVENSE, *Linnæus, Sp. Plant.* 1528. *Hudson, Fl. Ang.* 451. *Bolton, Fil. Brit.* 14, t. 9. *Fl. Dan.* iii. t. 391.

ACROSTICHUM MARANTÆ, *Pallas, Itin.* iii. 293. *Hœnke, Jacq. Collect.* ii. 5.

POLYPODIUM ILVENSE, *Villars, Hist. Pl. Dauph.* iii. 848. *Roth, Cat. Bot.* 133. *Swartz, Schrad. Journ. Bot.* 1800, ii. 27; *Id., Syn. Fil.* 39. *Schkuhr, Krypt. Gew.* 16, t. 19. *Willdenow, Sp. Plant.* v. 198. *Presl, Tent. Pterid.* 180. *Sturm, Fl.* (Farrn.) t. 1. *Fl. Dan.* xiii. t. 2186.

POLYPODIUM MARANTÆ, *Hoffmann, Deutschl. Fl.* ii. 5.

POLYPODIUM ARVONICUM, *Withering, Arr. Brit. Pl.* iii. 774 (not of Smith).

POLYSTICHUM? MARANTÆ, *Roth, Fl. Germ.* iii. 92.

ASPIDIUM RUFIDULUM, *Swartz, Syn. Fil.* 58. *Willdenow, Sp. Plant.* v. 282. *Poiret, Enc. Supp.* iv. 519.

ASPIDIUM DISTANS, *Viviani, App. Fl. Cors.* 8.

NEPHRODIUM RUFIDULUM, *Michaux, Fl. Bor. Amer.* ii. 269.

LASTREA RUFIDULA, *Presl, Tent. Pterid.* 76.

NOTHOCHLÆNA RUFIDULA, *Desvaux, Prod.* 221.

Caudex short, sub-globose, erect or decumbent, tufted, furnished with a few scales on the crown. *Scales* lanceolate, much acuminated

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or subulate, pale brown. *Fibres* dark brown, wiry, branched, slightly hairy.

Vernation circinate, the young fronds becoming bent like a shepherd's crook.

Stipes pale reddish brown, from one to two inches long, articulated above the base, which is terminal and adherent to the caudex; and as well as the *rachis* crinite, with numerous pallid subulate scales.

Fronds from two to four or six inches long, lanceolate oblong, herbaceous dull deep green, more or less rusty beneath from the abundant reddish scales, pinnate. *Pinnæ* opposite or alternate, ovate-oblong, deeply pinnatifid, sessile or very shortly stalked, more distant below, all spreading or nearly horizontal; the larger ones about an inch, the smaller half an inch, in length. *Lobes* eight to twelve, oblong obtuse, the basal ones largest, their margins obscurely crenate, and as well as the upper surface furnished with coarse scattered hairs, in addition to which on the under surface are numerous long subulate scales on the rachides and veins.

Venation of the lobes consisting of a flexuous and not very distinct *costa* or midvein, from which arise alternate *veins;* the lower of these are usually forked some distance from their base, and the *venules* extend quite free nearly to the margin, and bear the sori near to but below the apex; the upper veins, which are also fertile, are simple.

Fructification on the back of the frond, scattered nearly equally over the whole surface, sometimes copious and becoming confluent, situated below the apex of the veins and venules. *Sori* circular, consisting of few spore-cases, seated within, that is above, a small membranaceous scale, whose margin is fringed with jointed shining hairs, which curve inwards, involving the spore-cases; hence they are involucrate. *Spore-cases* roundish-obovate. *Spores* oblong, roundish, or irregularly three-cornered, muriculate.

Duration. The caudex is perennial. The fronds are annual, growing up in spring, about March, and perishing in autumn.

The chief peculiarity of the genus to which this species is referred, is found in the peculiar investing membrane which covers the sorus, and which is not easy of examination without careful manipulation. This membrane or involucre consists of a small concave scale, resting

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on the vein, beneath the sorus, having its margin fringed with numerous hair-like segments, which are incurved over the spore-cases. This structure gradually merges through some exotic species into an undivided bladdery cup, containing the spore-cases. The genus *Woodsia*, in this comprehensive sense, may therefore be taken to indicate the passage from the polypodiaceous to the cyatheaceous structure.

This is one of the rarest of our native Ferns, occurring in the crevices of moist rocks, in limited quantity, and in few and distant stations, among the mountains of Scotland and Wales, and in the north of England; ranging in elevation probably from 1200 to 2000 feet, or thereabout. In Scotland it has been found in the Clova Mountains in Forfarshire, and it has been also reported from the vicinity of Stirling, and from Ben Lawers. Mr. Gray has favoured us with specimens from his herbarium, which appear to have been gathered at Forres, in Morayshire. It occurs rather plentifully in deep ravines among the hills dividing the counties of Dumfries, Peebles, and Selkirk; and Mr. Johnstone has found it in a glen of brittle clay-slate formation, occupying a space of about two hundred yards, commencing at a foot from the ground, and ascending the almost perpendicular rocks to the height of thirty feet. The plants were found only on the side of the glen having a western exposure. Mr. I. Hudhart, Mr. Clowes, and others have found it among the mountains of Westmoreland in three distinct places, and also on one of the Cumbrian mountains. Teesdale, in Durham, is another old locality in which it has probably been nearly eradicated. In Wales it is met with, rarely, in the Snowdon district.

N. Wales.—Carnarvonshire: Clogwyn-y-Garnedd; Llyn-y-cwm, on Glyder-Vawr, *W. Wilson;* Pass of Llanberris, left hand side looking towards Capel Curig, *L. Clark.*

Humber.—[Yorkshire.]

Tyne.—Durham: Falcon Clints, *Winch;* Cauldron Snout, Teesdale, *J. Backhouse.*

Lakes.—Westmoreland, "on three different mountains," *I. Hudhart, F. Clowes.* Cumberland, *I. Hudhart, F. Clowes.*

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W. Lowlands.—Dumfries-shire: ravine near Loch Skene, *Rev. W. Little;* Devil's Beef-tub, and hills north of Moffat, *P. Gray;* abundant on steep crumbling rocks, on the hills dividing Dumfries and Peebles-shire, *W. Stevens.*

E. Highlands.—Perthshire: Ben Chonzie, near Crieff, *Dr. Balfour;* Ben Lawers, *J. Backhouse.* Forfarshire: Glen Fiadh, Clova Mountains, *W. Wilson, J. Backhouse.* Morayshire: Forres, *Hb. S. F. Gray.*

This fern appears to be more abundant in the north of Europe than with us. It is found in Iceland, Lapland, Norway, Sweden, Denmark, and in Russia from Nova Zembla to the Crimea and the Caucasus. Southwards, it is recorded as being found in Germany, Switzerland, France, Hungary, Italy and Spain. In Asia it occurs in Siberia, in the regions of the Altai Mountains and Lake Baikal, and extends to Kamtschatka and Awatschka Bay. It is found in Arctic America, about the Saskatchawan, and in the Rocky Mountains of north-west America, in Canada, and in the United States.

The present species differs from *Woodsia alpina*—(1) in the greater breadth and development of the frond, which is lanceolate and not linear, the pinnæ being elongated and oblong, not short and deltoid; and (2) in the crinite vestiture of the stipites and rachides, and of the lower surface of the ribs and veins of the frond, *W. alpina* being almost destitute of subulate scales, although sparingly furnished with tubular jointed hairs. Mr. Wollaston points out a further difference, namely, that at the period of vernation, whilst *W. ilvensis* shows no trace whatever of its fructification, the sori in *W. alpina* are remarkably conspicuous. The two plants indeed, though united by some botanists, are totally and permanently distinct.

This species may be cultivated in the same manner as the following, under which, some cultural directions will be found.

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THE ALPINE or DELTOID WOODSIA.

WOODSIA ALPINA.

W. fronds linear pinnate, slightly hairy, not scaly; pinnæ triangular, or triangular-ovate, obtuse, pinnatifid or lobed, the lobes roundish obovate, nearly or quite entire; stipes and rachis very slightly hairy. [Plate CVI.]

WOODSIA ALPINA, *Gray, Nat. Arr. Brit. Pl.* ii. 17 (1821) in part. *Newman, Nat. Alm.* (1844) 13; *Id., Hist. Brit. Ferns*, 3 ed. 79. *Tausch, Flora*, xxii. 480. *Deakin, Florigr. Brit.* iv. 46, fig. 1584. *Moore, Handb. Brit. Ferns*, 3 ed. 251; *Id., Ferns of Gt. Brit. Nature Printed*, t. 47 B.

WOODSIA ILVENSIS, *β.* and *γ., Babington, Man. Brit. Bot.* 4 ed. 420.

WOODSIA HYPERBOREA, *R. Brown, Trans. Lin. Soc. Lond.* xi. 173, t. 11. *Smith, Eng. Fl.* 2 ed., iv. 310. *Hooker & Arnott, Brit. Fl.* 7 ed. 583. *Moore, Handb. Brit. Ferns*, 2 ed. 68. *Sowerby, Ferns of Gt. Brit.* 15, t. 6. *Nyman, Syllog. Fl. Europ.* 430. *Sprengel, Syst. Veg.* 125. *Desvaux, Prod.* 318. *Link, Fil. Sp.* 134. *Hooker, Gen. Fil.* t. 119. *Fries, Sum. Veg.* 82. *Ledebour, Fl. Rossica*, iv. 511. *Ruprecht, Dist. Crypt. Ross.* 53. *Fée, Gen. Fil.* 338; *Id., Iconograph. Nouv.* t. 26, fig. 4. *Lowe, Nat. Hist. Ferns*, vii. t. 27.

WOODSIA PUBESCENS, *Opiz;* according to Steudel.

WOODSIA INTERMEDIA, *Ruprecht, Dist. Crypt. Ross.* 54.

ACROSTICHUM ALPINUM, *Bolton, Fil. Brit.* 76, t. 42. *Poiret, Enc. Supp.* i. 129.

ACROSTICHUM HYBERBOREUM, *Liljeblad, Stockh. Trans.* (1793) 201, t. 8.

POLYPODIUM HYPERBOREUM, *Swartz, Schrad. Journ. Bot.* 1800, ii. 27; *Id. Syn. Fil.* 39. *Smith, Eng. Bot.* xxix. t. 2023. *Schkuhr, Krypt. Gew.* 189, t. 17 *b. Willdenow, Sp. Plant.* v. 197. *Weber and Mohr, Deutschl. Krypt.* 27, t. 2, fig. 1, 2. *Presl, Tent. Pterid.* 180, t. 7, fig. 6. *Fl. Dan.* xiii. t. 2185. *Sturm, Fl.* (Farrn.) t. 1.

POLYPODIUM ARVONICUM, *Smith, Fl. Brit.* iii. 1115.

POLYPODIUM FONTANUM, *Linnæus, Hb.*

POLYPODIUM ILVENSE, *Wilhering, Arr. Brit. Pl.* iii. 774.

POLYPODIUM HYPERBOREUM, et *β.* GRACILE, *Wahlenberg, Fl. Lapp.* 279.

CETERACH ALPINUM, *De Candolle, Syn. Pl. Gall.* 115; *Id., Fl. Franç.* 3 ed. ii. 567.

Caudex short, subglobose, forming a small erect or decumbent crown, furnished with a few scales above. *Scales* lanceolate, pale brown. *Fibres* dark brown, wiry, smooth, branched.

Vernation circinate.

Stipes pale reddish-brown, from three-fourths of an inch to two inches long, articulated at about one-third of its length from the base,

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which is terminal and adherent to the caudex, as well as sparingly furnished with pale membranaceous hair-scales. *Rachis* slightly coloured, and bearing a few pale narrow deciduous hair-scales.

Fronds from two to six inches long, linear in outline, membranaceo-herbaceous, tender green, pinnate. *Pinnæ* not rarely subopposite, more frequently alternate, triangular-ovate, obtuse, sessile or very shortly stalked, pinnatifid, the lower ones distant; the latter separated about three-eighths of an inch in the smaller plants and three-fourths of an inch in the more vigorous ones, the pinnæ being about one-fourth of an inch long in medium-sized specimens, up to about half an inch in the larger ones; the upper pinnæ are more closely placed, and all are set on nearly horizontal. *Lobes* five to seven, roundish obovate, largest at the base, the lowermost sometimes divided nearly to the midvein, the upper ones more confluent, and the apex, in the most vigorous specimens, notched so as to indicate an additional pair of lobes; they are entire or obscurely crenate on the margins, furnished with a few scattered tubular jointed hairs and hair-scales, which also occur here and there on both the upper and the under surface.

Venation of the lobes consisting of a flexuous indistinct *costa* or midvein, from which proceed alternate *veins;* the lower veins are forked, but seldom more than once, and the upper ones are undivided; both veins and *venules* terminate within the margin in a slightly thickened point. The anterior venules of the forked veins, and some or all of the simple veins bear sori.

Fructification produced over the whole back of the frond, but somewhat more copiously in the upper part. *Sori* situated below the apex of the venules, hence medial, and often at length confluent over the lobes; circular, seated within, that is above, a small membranaceous scale whose margin is fringed with jointed hairs curving inwards so as to enclose the spore-cases: hence the sori are involucrate. *Spore-cases* roundish obovate. *Spores* brown, round or roundish-oblong, the surface granulated or tuberculate.

Duration. The caudex is perennial. The fronds are annual, growing up in spring, and perishing late in autumn.

The above description of this very rare species has been drawn

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up from a series of remarkably fine specimens, collected on the hills bordering Glen Lochy in Perthshire, by Mr. J. T. Syme. We regard it as being perfectly distinct from *Woodsia ilvensis*, from which it is readily dissociated when the eye once becomes acquainted with it. The fronds are smaller, narrower, and smoother, than in *W. ilvensis*, which latter is furnished with a clothing of chaffy scales beneath, which are wanting in *W. alpina*. The present species, under the excitement of the artificial conditions imposed on it in a state of culture, does perhaps sometimes acquire greater breadth of frond than is observable in the wild specimens, yet the proportions and general features of the plant remain quite unchanged, and no species can be considered to bear the test of cultivation with less variation of character. It is, indeed, much more like the *W. glabella* than *W. ilvensis*, but the fronds of that plant are still narrower and more slender in their proportions.

This species is if possible, still more rare, than the *Woodsia ilvensis*. Its head-quarters appear to be the mountains of Perthshire; it occurs also in Forfarshire, but the reported habitat of the Moffat Hills in Dumfries-shire, is not clearly referred to this species. The rocky precipices of Snowdon, where the rock is described as being of a peculiar character, resembling limestone, are the only other places in which it is known to grow naturally within the United Kingdom. The habitats are:—

N. Wales.—Carnarvonshire: Clogwyn-y-Garnedd, Snowdon, on precipices facing east, and north-west; rocks facing the east above Glas Lyn, *L. Clark;* Moel Lechog, Pass of Llanberris, *L. Clark.*

E. Highlands.—Perthshire: Ben Chonzie, near Crieff, *Dr. Balfour;* Ben Lawers, *Dickson, W. Wilson;* Mael-dun-Crosk; Catjaghiamman; Craig Challiach, *W. Wilson;* on the hills between Glen Lochy and Glen Dochart, *J. T. Syme.* Forfarshire: Glen Isla, *Dr. Balfour;* Glen Fiadh, Clova Mountains, *Dr. Balfour.*

Of the countries of Europe, this Fern has been found in Lapland, Finland, Norway, Sweden, Russia, Switzerland, France, Germany, Hungary, Silesia, Spain, and Transylvania. In Asia it occurs in

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Siberia, in the region of Lake Baikal; and in Kulu in the Punjab, on the southern slope of the Himalaya. In America it is found among the mountains of Massachusets, at Saskatchawan, and in the Rocky Mountains. In the same region, about Great Bear Lake, and on the islands of Davis's Straits, occurs the *Woodsia glabella* of Brown, which has probably small claim to specific rank, and is rather to be considered as a somewhat more slender state of *W. alpina*, in which the few hairs found on the latter, and which themselves replace the scales of *W. ilvensis*, have altogether disappeared.

The *Woodsias* are best cultivated in moderate-sized well-drained pots, kept in a cold frame, facing the north in the summer-season; and they should have a moderate degree of ventilation. They are very impatient of sunshine and stagnant moisture, although preferring a damp cool atmosphere. The crown of the plants may, in potting, be advantageously elevated a little between two or three thin pieces of sandstone, and neither crowns nor roots must be kept too damp, especially during winter, though the opposite extreme must be avoided. A shady shelf in a cool greenhouse, where there is a free circulation of air, or a dryish cold frame, are good situations in which to preserve them during the dormant season. When it becomes necessary to divide the tufts, which is the most ready means of propagation, it should be done very carefully in spring about the time they commence their seasonal growth; but it is wiser in the case of a plant that has become well established, not to disturb the roots. In obtaining them from their wild habitats for the purpose of cultivation, as with most others of the rare Ferns, it is found that small plants are much more successfully transplanted than the larger and older masses. We prefer to use a mixture of pure light loam and sand with a small proportion of peat, and charcoal, between the stones in potting, as being more evenly retentive of moisture than a lighter compost. Mr. Backhouse hints that, after being once planted, the less they are disturbed at the root the better.

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Genus XV: TRICHOMANES, *Linnæus.*

Gen. Char.—**Sori** involucrate, *i. e.* seated within extrorse-marginal (rarely recurved) urn-like cysts (involucres), sessile upon or more or less sunk in the margins of the fronds; the veins continued to form exserted filiform sometimes capitate **receptacles**, which are free within the cysts or involucres, and bear sessile lenticular sporecases at their base. **Involucres** funnel-pitcher-shaped or shortly bell-shaped, truncate and entire at the mouth, or two-lipped. **Veins** simple forked or pinnate from a central costa, simple costa-like in the ultimate segments, or flabellate-dichotomous; **venules** free, sometimes excurrent in the marginal teeth.

Fronds simple pinnate or decompound, pellucid-membranaceous, rarely sub-coriaceous.

Caudex rhizomiform, creeping (sometimes filiform), or erect cæspitose.

The species of this beautiful and extensive genus of Ferns may in almost all cases be known from those of other genera, except *Hymenophyllum*, by their being of a semi-transparent texture, which is a feature apparently common to the whole family, although some of the species having fronds thicker than others, acquire a somewhat coriaceous texture in the dried state. From *Hymenophyllum*, which has some representatives among British Ferns, the present genus is separated by the form and nature of the involucres.

The general structure of these two genera, which differ only in technical points, and are indeed in a few cases not easily separated, may be thus described:—From the stipites, which are harsh and wiry, branch out in a pinnate or flabellate manner a series of wiry branches of smaller size; these according to the degree of division occurring in the frond form, the rachides (primary secondary or tertiary), the costæ, or the veins and venules, which all have more or less a wiry character. The ultimate divisions of these parts are bordered, so as to form a flat expansion, with thin loosely-

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cellular tissue, of a delicate semitransparent character, and differing in appearance from that of most other Ferns. All the lesser divisions of the ribs are margined in this way, and the flat leafy parts thus formed are more or less confluent downwards; the margin being continued in some cases down nearly to the base of the stipes itself, and generally as far down as the top of the stipites, though sometimes the main rachis is not bordered. The degree in which this confluence of the cellular portions takes place, represents the degree of division in the frond, and in most cases gives the peculiar form it assumes. So that the fronds in these two genera may be said to consist of branched wiry ribs, margined with a thin lamina of cellular tissue, these margins being flattened out and more or less confluent; while the ends of a portion of the ribs as they reach the margin, or become projected beyond it, are surrounded by urn-shaped expansions of similar tissue within which the fructification is formed.

On this genus, Sir W. J. Hooker observes* :—"Closely allied as are the genera *Hymenophyllum* and *Trichomanes*, it is rare that one has a difficulty in recognising them; and yet it is not easy to point out the characters in few words. In *Trichomanes*, the involucres are mostly subcylindrical narrow-urceolate, the mouth spreading, entire or cut into two short usually spreading lips, which when a little elongated afford the character of *Didymoglossum* of Desvaux; their texture is firm and subcoriaceous, yet cellular; they are often quite sunk or immersed in the segment of the frond. The receptacles are filiform and not only exserted, but sometimes very much protruded, so as to be several times longer than the involucre, and either often varying on the same plant, or by their great fragility easily broken away, and then apparently short. The fronds are more generally erect, as far as can be judged from the dried specimens, and I am not aware that except in a very few instances, the margins of the segments are ever toothed or serrated, as is common in *Hymenophyllum*; but the characters now mentioned are not invariably constant. The species are I think more remarkable for beauty of form and delicacy of texture, than even those of *Hymenophyllum*."

The distinguishing feature of the genus *Trichomanes* may be taken to consist in the peculiar form of the involucre or urn-like cup in

* Hooker, *Species Filicum*, i. 114.

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which the spore-cases are developed. The peculiarity resides in its being entire or monophyllous as it is sometimes described, or truly urn-shaped; while that of *Hymenophyllum* is split down to the base into two divisions, and hence becomes two-valved.

The plants referred to this genus are widely distributed over the warmer regions of both hemispheres, but are more especially abundant in tropical America. They grow only in situations where shade and moisture abound; indeed their structure is not adapted for situations which are exposed or influenced by a drying atmosphere, and exposure for a few hours to conditions like these, would suffice to shrivel up their fronds. Their natural habitats are the deep recesses of tropical forests, where they luxuriate on the trunks of trees or on dripping rocks, surrounded by an atmosphere loaded with vapour.

The species of *Trichomanes*, excluding one or two which have spicate fructification (*Feea*, Bory) and reticulated veins (*Hymenostachys*, Bory), range under two sections, namely, § *Eutrichomanes*, and § *Didymoglossum*. The first of these groups contains those species which have the involucres equally truncate and plane or spreading at the mouth, as in *T. radicans*; the second which comprises those in which the mouth of the involucre becomes two-lipped from the unequal extension of its margin, is well represented by the *T. Filicula* of India and the East.

The name *Trichomanes* is an ancient Greek word, which is supposed to belong to *Asplenium Trichomanes*. It is said to be derived from *thrix, trichos* a hair or bristle, and *manos* soft thin or porous; the former term, it has been suggested in regard to its present application, alluding to the hair-like receptacles, and the latter to the texture of the frond. Another derivation, at least as applicable as the foregoing, is from *thrix, trichos* a hair, and *mania* excess, in allusion to the long hair-like exserted receptacles.

BRITISH SPECIES AND VARIETY.

T. radicans: fronds ovate or triangular ovate, the divisions usually crowded.

var. **Andrewsii**: fronds narrow lanceolate-ovate, the primary divisions narrow and distant.

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THE EUROPEAN BRISTLE FERN.

TRICHOMANES RADICANS.

T. fronds pellucid-membranaceous, ovate-lanceolate or triangular-ovate, tri-quadri-pinnatifid; the rachis everywhere, and the upper part or the whole of the stipes winged; ultimate segments linear, entire or obtusely bifid; involucres cylindrical, scarcely two-lipped, solitary in the axils of the upper segments, more or less margined or winged; rhizome long, creeping, tomentose. [Plate CVII A.]

TRICHOMANES RADICANS, *Swartz, Fl. Ind. Occ.* iii. 1736; *Id., Syn. Fil.* 143. *Willdenow, Sp. Plant.* v. 513. *Hooker, Sp. Fil.* i. 125 (excl. syn. *Hym. rupestre* Raddi, and *T. anceps* Wallich). *Hooker & Arnott, Brit. Fl.* 7 ed. 591. *Deakin, Florigr. Brit.* iv. 119, fig. 1615. *Babington, Man. Brit. Bot.* 4 ed. 428. *Moore, Handb. Brit. Ferns,* 3 ed. 255; *Id., Ferns of Gt. Brit. Nature Printed,* t. 48. *Newman, Hist. Brit. Ferns,* 3 ed. 283. *Sowerby, Ferns of Gt. Brit.* 72, t. 41. *Bentham, Handb. Brit. Fl.* 638. *Sprengel, Syst. Veg.* iv. 130. *Presl, Hymenophyll.* 16, t. 2 B. *Nyman, Syll. Fl. Europ.* 434. *Lowe, Nat. Hist. Ferns,* viii. t. 11.

TRICHOMANES SPECIOSUM, *Willdenow, Sp. Plant.* v. 514. *Sprengel, Syst. Veg.* iv. 131. *Presl, Hymenophyll.* 16. *Newman, Hist. Brit. Ferns,* 2 ed. 305.

TRICHOMANES EUROPÆUM, *Smith, Rees' Cyclop.* xxxvi. Art. *Trichomanes.*

TRICHOMANES HIBERNICUM, *Sprengel, Syst. Veg.* iv. 130.

TRICHOMANES BREVISETUM, *R. Brown, Hort. Kew.* 2 ed. v. 529. *Smith, Eng. Fl.* 2 ed. iv. 311. *Presl, Hymenophyll.* 16. *Mackay, Fl. Hib.* 344.

TRICHOMANES ALATUM, *R. Brown, Prod. Fl. Nov. Holl.* 159, in obs. *Hooker, Fl. Lond.* iv. t. 53.

TRICHOMANES PYXIDIFERUM, *Hudson, Fl. Ang.* 461. *Bolton, Fil. Brit.* 56, t. 30.

TRICHOMANES UMBROSUM, *Wallich, Cat.* 165.

TRICHOMANES SCANDENS, *Hedwig, Fil. Gen.* with fig. (t. 6, excl. syn.)

TRICHOMANES DIAPHANUM, *Humboldt Bonpland et Kunth, Nov. Gen. Plant.* i. 25; according to Sprengel.

HYMENOPHYLLUM ALATUM, *Smith, Eng. Bot.* xx. t. 1417. *Willdenow, Species Plant.* v. 526.

HYMENOPHYLLUM TUNBRIDGENSE, *β. Smith, Fl. Brit.* iii. 1142.

DIDYMOGLOSSUM ALATUM, *Desvaux, Prod.* 331 (excl. syn. Schkr.).

Var. **Andrewsii**: fronds lanceolate-ovate; primary divisions narrow, and, as well as the secondary, distant; involucres immersed; receptacles much elongated. [Plate CVII B.]

TRICHOMANES RADICANS, *v.* ANDREWSII, *Moore, Handb. Brit. Ferns,* 1 ed. 139; 3 ed. 255; *Id., Ferns of Gt. Brit. Nature Printed,* t. 48 C. *Newman, Hist. Brit. Ferns,* 3 ed. 292, with figure. *Babington, Man. Brit. Bot.* 4 ed. 428. *Deakin, Florigr. Brit.* iv. 120.

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TRICHOMANES SPECIOSUM, *v.* ANDREWSII, *Newman, Hist. Brit. Ferns*, 2 ed. 315.
TRICHOMANES ANDREWSII, *Newman, Hist. Brit. Ferns*, 2 ed. 14.
TRICHOMANES BREVISETUM, *β.* ANDREWSII, *Henfrey, Francis Anal. Brit. Ferns*, 5 ed. 67.

Caudex black, creeping, elongated, tomentose, covered with small thick-set articulated dark-coloured jointed hairs. *Fibres* black, stout, branched, densely tomentose.

Vernation circinate.

Stipes variable in length, from one-fourth to one-half the entire length of the frond, terete, margined above with a narrow membranaceous wing, which is sometimes continued nearly to the base, where it is clothed with articulated hairs; lateral, adherent to the rhizome. *Rachis* everywhere margined with a narrow membranaceous wing.

Fronds six to twelve inches or more in length, pellucid-membranaceous, dark olive-green becoming darker when dry, quite smooth, ovate-lanceolate or triangular-ovate, more or less attenuated at the apex, tripinnatifid or quadripinnatifid. *Primary divisions* (pinnæ-like segments) ovate-lanceolate; *secondary ones* ovate, obtuse, cuneate at the base; *tertiary ones* oblique oblong; the ultimate lobes or *segments* oblong, toothed, the teeth short, linear, entire emarginate or bifid. In highly developed fronds of the triangular form the secondary divisions are often longer and comparatively narrower, and the ultimate divisions are more distant. The teeth at the apex of each series of divisions are frequently more elongated.

Venation consisting of a series of forked ramifications (*veins*) of the wiry ribs which issue alternately from the main rachis and enter the primary divisions; these are everywhere bordered with a pellucid wing of the same loosely cellular texture as the frond itself. The lowest anterior branch of these veins (*veinlet*) in the ultimate segments is, in the fertile fronds, continued beyond the margin, and forms the receptacle; but in the barren portions the apices of the veinlets do not quite reach the margin.

Fructification scattered over the fronds, extra-marginal, *i. e.* the tubular involucres are projected outwards from the margin, the opening being exterior. *Sori* consisting of sessile spore-cases,

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clustered around the base of the filiform receptacle, which is free within the involucre, with its apex more or less projected beyond it. *Involucre* cylindrical cup-shaped or urn-shaped, somewhat tapering below, open exteriorly, supra-axillary, that is, produced in the upper axils of the (ultimate) lobes, more or less sunk in the apex of one of the lobes or teeth, the mouth sometimes slightly spreading, or shortly two-lipped. *Spore-cases* sessile, oblique, latero-vertically compressed, roundish or obovate. *Spores* irregularly roundish or oblong, sometimes three-cornered, minutely papillose.

Duration. The rhizome is perennial. The fronds are also persistent, enduring for many years if not injured; they are stated to be about three years arriving at maturity, full development being obtained in the second year, and fructification produced in the third, after which they often show symptoms of decay. The sterile fronds however retain their freshness for many years when placed under congenial conditions.

The pellucid much divided, yet not pinnated fronds of this species, produced from a creeping caudex, the extra-marginal urn-shaped or tubular involucres, the columnar filiform receptacle, and the oblique ring which girts the obliquely compressed sessile spore-cases, serve together to distinguish this plant from all other British Ferns. There are at least three forms or states of it met with in Ireland. One of these is the var. *Andrewsii* noticed below. Another with the fronds ovate-lanceolate, and the segments broader, most nearly accords with *T. radicans* of Swartz, as illustrated by Hedwig; while a third, more triangular in outline, with the segments apparently narrower, seems to represent the *T. speciosum* of Willdenow.

The *Trichomanes* is not now found in England, though it formerly grew in Yorkshire, in a small dark cavern, under a dripping rock a little below the spring of Elm Cragg Well, in Bellbank, scarce half a mile from Bingley. "Here, in 1758," Bolton writes, "I saw it in plenty," but some alterations were made, the cavern was destroyed, and the plant perished. In 1782, however, being then engaged in publishing his work on British Ferns, he was again fortunate in finding it in the same neighbourhood: "after several researches in

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Bellbank," he writes, "I found a root under a dripping rock." Bolton's figure certainly represents this plant. Mr. Babington also states that he has a specimen from the same place, exactly like Bolton's figure. There seems to be no question therefore, that it once grew there, though it has not as far as we know been gathered in this habitat during the present century. Its present stations within the limits of the United Kingdom, are confined to the south-west of Ireland, where, in the rocky glens, caves, and ravines of the counties of Cork, and Kerry, it is met with not unfrequently, and sometimes in a most luxuriant condition. We learn from Dr. Kinahan* that the *Trichomanes* flourishes in a district extending from about 51° 30′ N. to 52° 40′ N., Bantry being the most southern recorded station, and the Cumailte Mountains the most northern; and as far east as about 7° 50′ W. in the Blackwater Valley. The plant grows in the greatest perfection, that is, fruits most regularly and perfectly at Inveragh, and in the valley of the Blackwater; the extreme humidity of the Killarney district, whilst encouraging the ordinary growth of the plant, interfering with its fruiting. Outside this well marked district Dr. Kinahan observes, are two outlying stations at which it is now probably extinct, namely Wicklow in about 52° 10′ N. and 6° 20′ W., and Bellbank, near Bingley, Yorkshire, in about 53° 30′ N. and 1° 55′ W. On Turk Mountain, Killarney, one of the most celebrated stations, it ascends to an altitude of 1500 feet. The rapacity of collectors has thinned if not eradicated it in many localities, so that it becomes desirable not to point out too exactly the habitats which are known. We therefore merely indicate a few recorded stations:—

Humber.—Yorkshire: formerly found at Bellbank, near Bingley.

Leinster.—Wicklow: Hermitage Glen, *Dr. Mackay;* Powerscourt Waterfall, *Dr. Stokes.*

Munster.—Cork: Glendine near Youghal, *R. Ball;* Glenbour, Killeagh, near Youghal, *J. A. Fisher;* Temple Michael Glen near Cork, *D. Murray;* Ballinhasy Glen, near Cork; Bandon, *S. P. Woodward;* Fall of the Clashgariffe, *J. Drummond;* near Glandore, *Dr. Allman;* near Bantry, *C. C. Babington;* near the summit of Carrigeena, Kildorrery (elev. 1000—1200 feet), *J. Carrol.* Water-

* Kinahan in *Proceedings of Dublin Natural History Society*, v. 10.

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ford: Valley of the Blackwater, *Dr. Kinahan.* Limerick: Cumailte Mountains. Kerry: Turk or Torc Mountain, Killarney, *Dr. Mackay;* Valentia Island, *Miss H. Blackburne;* ravine of Cromaglaun Mountain, *W. Christy;* Mount Eagle, near Dingle, *D. Moore;* Gortagaree between Killarney and Kenmare, *Dr. Taylor;* Blackstones, Glouin Caragh, Inveragh, *W. Andrews;* Curaan Lake, Waterville, *C. C. Babington.*

Attaining apparently its present northern limit in Ireland, this Fern is also met with in western Spain, in the province of Galicia, these being its only known European habitats. It occurs in profusion in the African Isles of the Atlantic Ocean: Teneriffe, the Canaries, Madeira, and the Azores. In Asia it is found in India, *e. g.*, Nepal and Sikkim, where it assumes a more finely-divided form, and an outline resembling the var. *Andrewsii;* also in Khasya, Bootan, and Mergui. It is met with again in the West Indies, in Jamaica, and Martinique; in Alabama (a small slender form); in Mexico, Panama, New Grenada, and Venezuela (large, and much divided); in Brazil; in the Galapagos, and in the Society Isles. A variety, with almost sessile fronds and a spreading involucre, is found in Brazil, Ecuador, Mexico, and the Sandwich Isles; and several other forms, probably varieties, of this species, occur in various parts of South America. The *Hymenophyllum rupestre* of Raddi, which, fertile specimens collected by Gardner in the Organ Mountains, show to be a *Trichomanes;* and the *Trichomanes anceps* of Wallich, which some botanists include in this species, appear to be distinct.

In cultivation this Fern requires to be fixed to a firm and durable medium, for which such materials as porous stone, or earthenware, or brick are most suitable; and this must be kept constantly moist with trickling water. The creeping caudex then, as it grows, attaches itself in the manner of ivy to the damp surface of the material within its reach. To induce this growth of the stem and also a healthy development of the fronds, a constantly damp atmosphere is essential; indeed the fronds themselves should be almost constantly in a dripping state and always shaded. It is on this account that the plants are so well adapted for cultivation in Wardian cases, or under large

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bell-glasses. They like warmth and succeed well under a glass in a shady part of a plant stove or greenhouse. The following method of planting has been found suitable both for the *Trichomanes* and the kindred *Hymenophyllum*:—Procure some porous freestone in large masses, sufficient to form when placed together a rugged mass occupying a broad shallow pan or other convenient vessel, which as the plants are not readily removed, should be rather large than otherwise. Let the bottom of this be well drained with broken potsherds, and the stone placed so as to lie firmly, but somewhat elevated in the centre of the pan. Fill the interspaces with silver sand, and nodules of turfy peat, and with incorrosive wire, fix the caudex of the plant firmly to the surface, adding a little more sand and finishing by a thorough but gentle watering. If necessary the fronds must be supported in a firm position by means of some small stakes, so that the caudex may not be disturbed. This being completed, place a glass cover over the plant, and remove it to a shady place, either in a stove or greenhouse, or in a sitting room. After this, all that is required is frequent, or, indeed, almost daily, light sprinklings of water.

Mr. Andrews of Dublin, has been very successful in managing this plant. In September, 1841, a case was prepared purposely for cultivating it; the bottom was lined with zinc, and the framework covered with oiled lawn; the specimens were then planted in well drained pots in a compost of loam and coarse sand, interspersed with pieces of turf. Other plants were suspended across the roof of the case, the stems being attached to rods covered with moss. The plants were kept cool, and were well moistened daily. By October, 1843, the entire case was filled with fronds of large and strong growth.

Mr. N. B. Ward, also, has for many years cultivated this species with entire success, even amidst the smoke of London, in his closed cases; and fine examples of cultivated *Trichomanes* are now not rare. Mr. Ward in his interesting book on the growth of plants in Wardian cases, describes a remarkable instance of success in the management of this plant. He observes*: "The finest specimen of *Trichomanes* in cultivation of which I have any cognisance, is one in the

* Ward, on *The Growth of Plants in closely glazed Cases*, 2 ed. 39.

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possession of R. Callwell, Esq., of Dublin, whose account is so interesting that I copy it *verbatim* :—

"'In the spring of 1843, I received a small portion of rhizome, about five or six inches long, with one frond partially developed, and one other just appearing, which I placed in a bell-glass about fifteen inches diameter. In December, 1846, it quite filled the glass, and in that month I removed it into a case three feet ten inches by two feet six inches, and three feet four inches in height; the space under this, about twelve inches in depth, was filled with upturned flower-pots, charcoal, cocoa-nut husks, and light earth and peat. The plant now [1852] nearly fills this case. It is difficult to count the fronds accurately, but, as nearly as I can count them, they number two hundred and thirty or upwards, of fully-developed fronds; the length of the fully-opened fronds being from fourteen to twenty and a-half inches, taking the length from the end of the stem, where it starts from the rhizome, to the point of the frond. When removing it to the present case, in December, 1846, I cut away five or six fronds which had been injured by contact with the glass, but since that time not one of the fronds then existing, nor any of those since formed, have shown any symptoms of decay. As to the general treatment: having originally provided well for perfect drainage, I carefully sprinkle the surface of the fronds with water once or twice a week in summer, and less frequently in winter, and keep the door of the case (which is very close) always shut, the drainage-valve underneath always open. The case stands in a vestibule with nearly west aspect, quite sheltered from the south by the house, which is much higher than the vestibule. I strongly think that much of my success is due to the fact that the light is much subdued by shining through coloured glass windows (chiefly brown and orange). The general appearance of the plant is quite natural, the fronds bending down mostly. About three years ago, I placed, for experiment, a small portion of the rhizome with one open frond, on a block, and hung it up in the case. It has now nineteen expanded fronds, varying from nine to twelve inches in length, the rhizome having crept all round the block, and thrown down abundance of roots five or six inches long. I have not found any other Fern to thrive, or even to live, in this case except *Asple-*

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nium marinum, which seems to like the situation tolerably. I have even tried *Hymenophyllum tunbridgense*, and *H. Wilsoni*; neither of which lived past one year. The plant has never shown the least approach towards producing seeds, although I have seen many plants taken from the same locality (Turk Waterfall, Co. Kerry) which have fructified profusely.'"

This instance of success, Mr. Ward goes on to state, is suggestive of one or two reflections of practical application. "We see, first, how possible it is to grow some plants in closed cases in even more than their native luxuriance. I believe that it would be very difficult, if not impossible, to find such a patch of *Trichomanes* as is above described, either in Ireland or any part of the world. The next reflection is, that, in obedience to well-known physiological laws, whenever the foliage of a plant is developed to a greater extent than usual, the tendency to produce fruit becomes proportionally diminished, and sometimes, as in the above instance, ceases altogether—not one frond out of the two hundred and thirty fructifying. It would be interesting to watch the effect of exposure to stronger light, and of a diminished supply of water. We further learn that Ferns, like other plants vary much as to their natural states, and that, in order to grow even the British Ferns in one case, it will be necessary to pay attention to their respective wants.

"In order to grow all our Ferns under one roof, it would, of course, be necessary to fulfil their varying conditions of growth; and this might be easily effected by building a model of some antique ruin, or by imitating some mountainous ravine, or other bit of natural scenery, with water trickling down from the elevated portion of the rock, and flowing out of the house in a continuous stream at the bottom. In such a house, without any artificial heat, our Ferns would attain a luxuriant growth, unimaginable by those who know them only under ordinary circumstances. Each Fern could be supplied with a proper base of earth or rock, and each could have the amount of light most suited to its fullest development. The *Trichomanes* might there revel on its Turk rock, and gladden the eyes of the beholder with its lovely fronds spangled with iridescent rain-drops. At the base of the rock, and extending to the margins of the central brook, the two species of *Hymenophyllum*,

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with *Blechnum boreale, Lastrea Thelypteris,* and the lovely Lady Fern would luxuriate: whilst on the borders of the little brook or in the centre of the water, the royal *Osmunda* would raise itself to the height of ten or twelve feet, as if conscious of its sovereignty, and worthy of the admiration elicited from Sir Walter Scott when visiting the Lakes of Killarney. One or two chalk or sand-stone caves might be lined internally with the *Asplenium marinum,* its massive dark green and glossy leaves beautifully contrasting with the light and elegant foliage of the Maidenhair growing on the top. In the more elevated portions, and fully exposed to light, *Allosorus crispus, Cystopteris fragilis* and the other species and varieties would thrive (with the exception of the rare *Cystopteris montana,* which should be planted in reach of the spray); as would *Asplenium septentrionale* and the *Woodsias;* whilst every chink and crevice might be occupied with *Polypodium Dryopteris, P. calcareum, P. Phegopteris, Asplenium Trichomanes, A. Adiantum-nigrum, A. lanceolatum,* &c. Such a house might be made very useful in determining those varieties of ferns which depend upon varying climatal differences, and in limiting the multiplication of species, which now appears to be increasing rather too rapidly. A great number of the more beautiful or rare British flowering plants might be intermixed with the Ferns, and would add greatly to the effect of the whole, taking especial care that each should have the amount of light and moisture which it obtains in its natural state. So much for British Ferns and plants; but the time will most assuredly come when those citizens of London who now recreate and refresh their souls with such a house as is above described, will raise their desires to the possession of equally beautiful, but much more noble and majestic forms; I mean, particularly those of the Tree Ferns."

We have already mentioned that this plant is met with in three different forms, one of which is at least sufficiently different to be distinguished as a variety:—

1. *Andrewsii* (M.). This is analogous to many of the tropical forms of the species. Dr. Kinahan is of opinion that it is the normal state of the species, that met with at Killarney by which the Irish

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form of the plant is best known, having been, he believes, drawn up by moisture, under which influence, the parenchymatous portions are developed at the expense of the fructification; but as these broader forms are sometimes seen finely fructified under cultivation we are not disposed to adopt this view, and prefer rather to consider the form now under notice as a variety. Its chief peculiarities are that the fronds are narrower and more lanceolate in outline, the primary pinnæ-like divisions narrow, and as well as the secondary ones, more distant and distinct than in the other forms. Our figure only shows this on a small scale. The receptacles are also very much elongated, and Mr. Andrews, by whom it was discovered in Glouin Caragh, considers this the striking character of the plant. Mr. Newman points out that the involucres, in this form, are quite sunk in the margin of the frond, whilst they are distinct and almost stalked in the original or Killarney plant. The caudex in the var. *Andrewsii*, is moreover said to be scarcely tomentose, but this does not seem to be a fixed character. The stipes is more elongated and less winged than in the normal form. Mr. Andrews in a paper read before the Royal Irish Academy, mentions that as the receptacles elongated and became protruded beyond the involucres, the 'capsules' continued forming in an even dense mass to their extremity. We have noticed the same to occur in well fruited examples of the species itself.

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Genus XVI: HYMENOPHYLLUM, *Smith.*

Gen. Char.—**Sori** involucrate, *i.e.*, seated within extrorse-marginal oblong or sub-orbicular **involucres**; the veins continued to form the **receptacles**, which are short, cylindrical or globose at the apex, free, included within the involucres, and bear sessile lenticular or turbinate spore-cases. **Involucres** two-valved. **Veins** dichotomously branched, simple and costa-like in the ultimate segments, or simple parallel from a central costa in undivided fronds; **venules** free.

Fronds simple, variously pinnatifid, or often decompoundly divided, pellucid-membranaceous.

Caudex rhizomiform, creeping, usually filiform.

This genus, viewed as a whole, is so exactly the counterpart of *Trichomanes*, that the species of the two genera are quite undistinguishable, except by the technical characters afforded by their involucres. The separation of the two groups is however convenient, both of them being extensive; though it is perhaps rather to be supported on the ground of convenience than on the structural importance of the characters on which it is founded, since there are some species in which an intermediate condition of the involucres is met with; indeed the § *Didymoglossum* of the genus *Trichomanes* really stands in this position. In such cases, the difference becomes merely one of degree.

Like *Trichomanes* these are Ferns of semi-transparent texture and widely dispersed over the tropical regions of both hemispheres. The numerous species scarcely admit of assortment in well characterised groups, those which we adopt, namely, § *Hymenoglossum*, distinguished by its simple veins from a central costa, and § *Hymenophyllum*, distinguished by its simple costa-like veins in the ultimate segments, being very unequal divisions, the former group separating only one species, the *H. cruentum* of Chili. The larger remaining group is fairly represented by our native species. Some botanists have proposed other divisions founded on the form of the receptacles,

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and one of these, *Sphærocionium*, distinguished by the capitate termination of its receptacles, has met with partial reception as a genus, but the character does not appear to be of sufficient importance for generic definition; while for sectional subdivisions, such obvious features as those presented by the smooth or serrated margins of the fronds are preferable.

The name is derived from the Greek, *hymen, hymenos* a film or membrane, and *phyllon* a leaf: thus suggesting the very appropriate English name of Film Fern, which is preferable to that of Filmy Fern which has been sometimes employed.

SYNOPSIS OF THE SPECIES.

1. **H. tunbridgense**: pinnæ subvertical, pinnatifid; involucres erect, sessile, compressed, the valves serrate.
2. **H. unilaterale**: pinnæ decurved, sub-unilateral, digitately pinnatifid; involucres decurved in a direction opposite to the pinnæ, stalked, inflated, the valves entire.

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THE TUNBRIDGE FILM FERN.

HYMENOPHYLLUM TUNBRIDGENSE.

H. fronds pellucid-membranaceous, ovate or oblong, more or less elongated, pinnate; pinnæ subvertical, pinnatifid, decurrent forming a wing to the rachis; segments linear, undivided or bifid, and, as well as the upper margin of the roundish valves of the axillary solitary sessile compressed involucres, spinulosely serrate. [Plate CVIII.]

HYMENOPHYLLUM TUNBRIDGENSE, *Smith, Mem. Acad. Roy. Sc. Turin*, v. 418; *Id., Eng. Bot.* iii. t. 162; *Id., Eng. Fl.* 2 ed. iv. 313. *Hooker, Sp. Fil.* i. 95; *Id., Gen. Fil.* t. 32; *Id., Fl. Lond.* iv. t. 71. *Hooker & Arnott, Brit. Fl.* 7 ed. 592. *Babington, Man. Brit. Bot.* 4 ed. 428. *Mackay, Fl. Hib.* 345. *Deakin, Florigr. Brit.* iv. 122, fig. 1616. *Newman, Hist. Brit. Ferns*, 3 ed, 297. *Moore, Handb. Brit. Ferns*, 3 ed. 262; *Id., Ferns of Gt. Brit. Nature Printed*, t. 49 A. *Lowe, Nat. Hist. Ferns*, viii. t. 5 B. *Sowerby, Ferns of Gt. Brit.* 75, t. 42. *Bentham, Handb. Brit. Fl.* 638. *Gray, Nat. Arr. Brit. Pl.* ii. 19. *Willdenow, Sp. Plant.* v. 520. *Sprengel, Syst. Veg.* iv. 133. *Presl, Hymenophyll.* 32. *Hooker fil., Fl. New Zealand*, ii. 11. *Nyman, Syll. Fl. Europ.* 434.

HYMENOPHYLLUM ASPERULUM, *Kunze, Lin.* ix. 109. *Presl, Hymenophyll.* 32.

HYMENOPHYLLUM THUNBERGII, *Ecklon, Sched. Pl. Exsic. Cap.* 92; according to Kunze. *Presl, Hymenophyll.* 32.

TRICHOMANES TUNBRIDGENSE, *Linnæus, Sp. Plant.* 1561. *Hedwig, Fil. Gen.* with figure (t. 17). *Flora Danica*, t. 954.

TRICHOMANES PULCHELLUM, *Salisbury, Prod.* 404.

Caudex rigid, filiform, creeping, branched, dark brown, forming dense entangled carpet-like masses; furnished about the base of the fronds with a few hair-like scales. *Fibres* slender downy.

Vernation circinate.

Stipes slender, wiry, terete, varying from one-third to one-half the length of the frond, often slightly margined or winged in the upper part; lateral at intervals along the caudex, to which it is adherent. *Rachis* winged.

Fronds smooth, pellucid-membranaceous, minutely cellular, deep-olive or sometimes full olive-green, from one to four or six inches

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long, usually ovate, lanceolate-ovate, or oblong, more or less elongated, pinnate below. *Pinnæ* or primary divisions alternate, decurrent so as to form everywhere, except at the base of the larger fronds, a narrow entire wing to the rachis; distichous, ascending or sub-vertical, nearly rhomboid in circumscription, furcately bipinnatifid, that is to say, twice divided with the ramifications on a dichotomous or forked plan, the divisions alternating, and so placed as to show an apparent excess of development on the anterior side caused, as may be seen, by the medial or axial vein, which may be recognised, curving upwards. *Ultimate segments* linear, obtuse, spinulosely serrate.

Venation consisting of a series of dichotomous ramifications (two or three times repeated) of the wiry ribs which branch alternately from the main rachis, each ultimate segment having one of these divisions along its centre, and not quite reaching to its apex. Thus the fronds might be said to consist of slender branching wiry ribs everywhere bordered with a flat delicately cellular pellucid-membranaceous margin.

Fructification usually produced in the upper half of the fronds, extra-marginal, *i. e.* the two valved involucres replace the lowest anterior segment, and are projected outwards from the margin, the opening being exterior. *Sori* consisting of numerous spore-cases clustered around the short receptacle, on which they are sessile. *Receptacle* formed of the altered apex of the vein (usually the lowest anterior vein of the pinna) spongy, oblong-clavate, free and central within the involucre, and shorter than its valves, therefore included. *Involucres* sessile, supra-axillary *i. e.* borne in the axils of the pinnæ or primary divisions, short, compressed, the base somewhat inflated, cuneate and more or less sunk in the segment, two-valved, the valves semiorbicular, flattish, spinulosely serrate at the upper margin. *Spore-cases* sessile, affixed obliquely, vertically compressed, thus lenticular, with a transverse ring. *Spores* minute, irregularly oblong, or triangular. In ordinary cases the lower anterior segment of each pinnæ only is fertile, but sometimes one or more others are also soriferous.

Duration. The rhizome is perennial. The fronds are also perennial, growing up in the course of the summer, attaining their full

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growth during the season, but enduring two or three years under favourable circumstances.

The two British *Hymenophyllums*, may be known from other Ferns by the interlacing growth of their thread-like rhizomes, by the small size, and pellucid cellular texture of their fronds, whose segments have each only a central rib, and by the two-valved marginal fructifications. They may be best known from each other by the form of the involucres and of their valves; which in *H. tunbridgense* are sessile and erect, with the valves roundish and flattish, the upper margin spinulosely-serrate, like the margin of the segments of the pinnæ, whilst in *H. unilaterale* they are stalked and deflexed, with the valves ovate and convex, and the margin quite even.

No varieties of importance have been observed in the British species belonging to this genus.

The Tunbridge Film Fern is found in mountainous and rocky situations, usually carpeting the damp surface of the rocks themselves, but sometimes growing on the ground amongst moss in moist places, or moss-like on the trunks of trees. It is extensively dispersed, being found in England in the south and south-west, extending northwards through Wales and the Midland Counties to York, and the Lake District; occurring also both in the Lowlands and Highlands of Scotland, as well as in the Isles of Mull and Bute. In Ireland it is abundant and remarkably fine in some localities. Mr. Newman mentions that *H. tunbridgense* exhibits a preference for shade, warmth, and shelter; whilst its ally, *H. unilaterale*, establishes itself on bleak and exposed rocks. According to Mr. Watson, our present species ranges from the coast level to an elevation of about 1200 feet. The following is a summary of habitats:—

Peninsula.—Cornwall: Rough Tor near Camelford, *C. C. Babington;* near Penryn, *Miss Warren.* Devonshire: Bickleigh Vale, *Miss Griffiths;* Vixen Tor, Staple Tor, Wistman's Wood, and Shaugh Bridge, Dartmoor, *T. B. Flower;* Becky Fall, near Moreton, *R. J. Gray;* Dunsford Bridge; Cornwood, *Fl. Plym.* Somersetshire: Shepton Mallet.

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Channel.—Kent: Tunbridge Wells; rocks in Eridge Park, *W. Pamplin.* Sussex: Cockbush near Chichester, *Sherard;* High Rocks, Tunbridge Wells; West Hoathly, *E. Newman;* Ardingly, near Cuckfield, *S. O. Gray;* Handcross; Balcombe, *J. Lloyd;* Tilgate Forest, *J. A. Brewer.*

Severn.—? Staffordshire.

Mersey.—Cheshire: near Croydon brook; hills from Macclesfield to Buxton. Lancashire: Cliviger, *S. Gibson;* Rake Hey Common, near Todmorden, *S. Gibson.*

Humber.—Yorkshire: Hayburn-Wyke; Esk Dale, near Whitby; Greenfield, near Saddleworth, *W. Wilson;* near Settle, *Dr. Richardson;* near Halifax, &c.

Lakes.—Cumberland: Hawl Gill, Wastwater, *J. Robson;* Ennerdale, *J. Dickinson.* Westmoreland: Buzzard Rough Cragg, near Wrenose, *Ray.* North Lancashire: Conistone.

S. Wales.—Glamorganshire: Melincourt Waterfall, *T. Westcombe;* Cilhepste Waterfall, *E. Young;* Pont-nedd-Vechn. Brecknockshire: Llanwrtyd, *T. H. Thomas.*

N. Wales.—Merionethshire: Crofnant near Harlech, *W. Wilson;* Dolgelly; Cwm Bychan, near Barmouth, *Rev. T. Salway;* Vale of Festiniog, *H. C. Rothery;* Cader Idris, *J. E. Bowman;* Rhaiadr Du, near Maentwrog, *E. Newman.* ? Anglesea. Carnarvonshire: near Llanberris; Snowdon, *T. Hankey.*

W. Lowlands.—Dumfries-shire: Drumlanrig, *Mr. Cruikshank.* Lanarkshire: Banks of the Clyde.

E. Lowlands.—Peebles-shire.

E. Highlands.—? Stirlingshire. ? Perthshire.

W. Highlands.—Argyleshire: Bullwood; Dunoon, *W. Gourlie;* Glen Gilp, Ardrishiag, *C. M'Intosh.* Dumbartonshire: Banks of Loch Lomond, *W. Gourlie;* Loch Long. Isle of Mull: Kinlochspelvie near Loch Spelvie, *J. T. Syme.* Isle of Bute, *Dr. Balfour.* Isle of Arran, *Dr. Balfour.*

N. Highlands.—? Ross-shire.

Connaught.—Galway: Connemara, *Dr. Graham;* Ballynahinch, *Dr. Balfour.*

Leinster.—? Dublin. ? Wicklow.

Munster.—Clare: Monounta, Feacle, on cliff 500 ft. high, *J. R.*

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Kinahan. Tipperary: Morgan's Glen, *E. H. Sargint.* Cork: Glengariff, Bantry, *C. C. Babington;* Glenbower, Killeagh, *Dr. Power;* Dunbullogue Glen, *D. Murray;* Ballinhassig Waterfall, *J. Drummond.* Waterford: Glandine, *J. R. Kinahan;* Portlaw, *J. R. K.;* Curraghmore Wood, *J. R. K.* Clonmel, *J. Sibbald.* Kerry: Glen Carnn, *W. Andrews;* Valentia Island; rocks over Glenleavey Woods, *J. R. Kinahan;* Inveragh, *W. Andrews;* about Killarney, very fine and abundant, *W. Wilson;* and elsewhere.

This species occurs in alpine or sub-alpine districts over the greater part of Europe, being recorded from Sweden and Norway, France, Belgium, Germany, and Italy. Ledebour does not mention its occurrence in the extensive range of country, both European and Asiatic, represented by the *Flora Rossica.* It is however found in India; in the Azores and Madeira, and in South Africa; in the island of Mauritius; in Chili and Brazil; in New Holland, and in New Zealand. There also occurs in New Zealand, as well as in Tasmania, and New Holland, and again at the Cape of Good Hope and in the Organ mountains of Brazil, a variety, the *H. cupressiforme* of Labillardière, which differs in its narrower recurved segments, in this respect resembling *H. unilaterale,* but having the denticulate involucre-valves of *H. tunbridgense.*

The culture of this plant assimilates closely to that of *Trichomanes,* to which we may refer. We here subjoin some very explicit instructions published by Mr. Johnson*:—"It prefers being kept continually damp and warm, which renders it a most valuable acquisition to the Wardian case, where it may be grown separately, as also under a plain bell-glass, or may be mixed with others which likewise prefer a similar situation; but whichever may be chosen for its cultivation, rather more care will be necessary in arranging it than will be required for most other Ferns. The situation it generally chooses for its habitat will be found to be nearly or quite free from all vegetable moulds, and these may be quite dispensed with in pot or artificial culture. Although we have seen it grown very well in equal parts peat and silver sand, yet we have always found it

* Johnson, in *Cottage Gardener,* xv. 190.

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thrive best under the following treatment:—If to be grown as a pot plant, procure as many shallow pots or deep pans as may be required (from eight to twelve inches wide will be as convenient a size as any, and will grow a nice mass); fill the pot or pan to within an inch and a half or two inches of the rim with small crocks, upon this place half an inch of white moss (*sphagnum*), which press down tight; the pot is then to be filled quite full with powdered sandstone, which is also to be pressed down very firm, and upon this a little silver sand is to be sprinkled. Then turn the Fern tuft root upwards, damp the roots, and sprinkle a little sand upon or between them; after that turn the whole over upon the surface prepared for its reception, sprinkle a little more dry sand over the surface, press it all down together, give it a good watering and leave it to settle. This is when the Fern is procured in flakes (which may be found several yards square) just like a sheet of wadding. If only a few small pieces can be got, then they must be very carefully spread over the same prepared surface and imbedded in the sand, pressed down and watered as before. When this is done, a bell-glass must be placed over the whole so as to fit just within the rim of the pot, and the pot to stand in another pan of water, so that two-thirds of the depth of crocks at the bottom of the pot may be immersed in water, but the level of the water must be below the bottom of the moss."

The plants require a glass covering to preserve about them a constantly moist atmosphere; and constant, but not stagnant, moisture, should be maintained about their roots. These are their main requirements, and it matters little how they are applied, whether in a Wardian case, or beneath a common bell-glass. We learn from Mr. Clowes, who has been more than ordinarily successful in managing the Film Ferns, that the bell-glasses ought always to have a small opening near the top of the glass: indeed he considers two such openings better than one, so as to secure a current of air over the top; until he adopted this expedient, his efforts to cultivate these plants were attended with but little success.

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WILSON'S FILM FERN.

HYMENOPHYLLUM UNILATERALE.

H. fronds pellucid-membranaceous, pinnate, elongate-oblong; pinnæ decurved, sub-unilaterally digitate-pinnatifid, slightly decurrent forming a narrow wing to the upper part of the rachis; segments linear, undivided or bifid, spinulosely serrate; involucres axillary, solitary, stalked, ovate, inflated, the valves entire. [Plate CIX.]

HYMENOPHYLLUM UNILATERALE, *Bory MS.: Willdenow, Sp. Plant.* v. 521. *Newman, Hist. Brit. Ferns*, 3 ed. 301. *Moore, Handb. Brit. Ferns*, 3 ed. 264; *Id., Ferns of Gt. Brit. Nature Printed*, t. 49 B. *Sowerby, Ferns of Gt. Brit.* 76, t. 43. *Sprengel, Syst. Veg.* iv. 133. *Presl, Hymenophyll.* 32. *Hooker fil., Fl. New Zeal.* ii. 11. *Lowe, Nat. Hist. Ferns*, viii. t. 6.

HYMENOPHYLLUM WILSONI, *Hooker, Brit. Fl.* 1 ed. 450; *Id., Sp. Fil.* i. 95. *Wilson, Supp. Eng. Bot.* t. 2686. *Hooker & Arnott, Brit. Fl.* 7 ed. 592. *Mackay, Fl. Hib.* 345. *Babington, Man. Brit. Bot.* 4 ed. 428. *Deakin, Florigr. Brit.* iv. 124, fig. 1617. *Presl, Hymenophyll.* 31. *Nyman, Syll. Fl. Europ.* 434.

HYMENOPHYLLUM TUNBRIDGENSE, *Schkuhr, Krypt.* 134, t. 135 *d* (excl. syn.).

HYMENOPHYLLUM TUNBRIDGENSE, *β. Kunze, Linn.* x. 555. *Bentham, Handb. Brit. Fl.* 638.

HYMENOPHYLLUM PELTATUM, *Desvaux, Prod.* 333; according to Hooker.

HYMENOPHYLLUM MENZIESII, *Presl, Hymenophyll.* 31, 51; according to Hooker.

HYMENOPHYLLUM MEYERI, *Presl, Hymenophyll.* 31, 50; according to Hooker.

TRICHOMANES PELTATUM, *Poiret, Enc. Bot.* viii. 76; according to Desvaux.

TRICHOMANES TUNBRIDGENSE, *Lightfoot, Fl. Scot.* 681. *Bolton, Fil.* 58, t. 31.

Caudex rigid, filiform, creeping, branched and forming dense entangled masses, dark brown, bearing a few hair-like scales about the bases of the fronds. *Fibres* slender, downy.

Vernation circinate.

Stipes slender, wiry, terete, one-third the length of the frond or often less; distant and lateral on the caudex, to which it is adherent. *Rachis* terete below, narrowly-winged above.

Fronds smooth, pellucid-membranaceous, minutely cellular, dark olivaceous green, from one or two to five or six inches long, oblong or linear *i. e.* elongate-oblong, pinnate. *Pinnæ* decurrent in the upper

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part, and there forming a narrow wing to the rachis, distinct below; curved backwards, subunilateral, wedge-shaped in circumscription, digitately pinnatifid, *i. e.* two or three times dichotomously forked, without an axial vein, the segments developed on the anterior side. *Ultimate segments* linear, obtuse, spinulosely serrate. The fronds when luxuriant have a tendency to become branched.

Venation consisting of two or three dichotomous ramifications of the wiry ribs, which branch alternately from the main rachis; each ultimate segment having one of these ribs or veins along its centre, not quite reaching to the apex.

Fructification produced on the upper parts of each annual growth, extra-marginal and supra-axillary as in the former species. *Sori* consisting of numerous spore-cases, clustered around the short receptacle, on which they are sessile. *Receptacle* free, central, spongy, oblong club-shaped, shorter than the valves of the involucre. *Involucres* supra-axillary, more or less obviously stalked, curved forwards, *i. e.* in a direction opposite to that of the segments, inflated, two-valved, the valves ovate-oblong, strongly convex, and quite entire at the edges, which are at first closed, but at length become gaping. *Spore-cases* sessile, vertically compressed, thus lenticular, obliquely affixed. *Spores* minute, irregularly triangular. In some instances, especially where the frond becomes branched at the apex, numerous sori are borne without order on the segments, but usually they are confined to one on each pinna, next the rachis.

Duration. The rhizome is perennial. The fronds are perennial, enduring for two or three years, or more, renewing their growth annually, as in the well-known case of *Lycopodium annotinum.*

We are indebted to Mr. F. Clowes, of Windermere, for the interesting observation that the fronds of this species of *Hymenophyllum* resume their growth after the first year, unlike those of *H. tunbridgense,* which complete their growth in one season. Mr. Clowes obligingly communicated for our folio edition (in 1856), the following note of his observations:—"I have a large plant of *H. tunbridgense* and of *H. unilaterale,* which were put into a case in March, 1854. Both are growing vigorously; but I remark that *all* the fronds of *H. tunbridgense* are annual—I mean, they

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come up in spring, bear fruit more or less, persist more or less, but never *grow* more than one year; while those of *H. unilaterale* go on growing year after year. A great number of the fronds which were on the plants when placed in the case went on growing, bore fruit at or near the extremity of the fronds that year, grew on again and bore fruit last year, and are doing the same this year (1856), so that some fronds are ten inches long, and wide in proportion. This is not the effect of cultivation, as the wild plant does exactly the same—growing 'annotinously,' in fact, exactly as occurs in *Lycopodium Selago* and *Bartramia Halleriana*, there being no distinct marks between the different years' growth."

This species is more extensively distributed than *H. tunbridgense*, though the two plants very frequently occur in company. The present is met with in the south-west of England, and is reported from several midland counties; it is found both in North and South Wales; and in the north of England, especially in the Lake District, it becomes plentiful. It is the commoner of the two species in Scotland, occurring both in the Lowlands and Highlands as far north as Sutherlandshire, and extending even to the Northern and Western Isles. In Ireland it occurs plentifully, and in all the provinces. In altitudinal range this plant is found from the coast level to an elevation of upwards of 2700 feet, which it attains in the outer Hebrides, according to the observations of Dr. Balfour and Mr. Babington. The following habitats more exactly indicate its range.

Peninsula.—Cornwall: Bodmin; Carn Brea, near Redruth, *H. C. Watson;* Rough Tor, near Camelford, *C. C. Babington;* Granite Tor, *Miss Warren.* Devonshire: Becky Fall, near Moreton, *R. J. Gray;* West Lynn, *N. B. Ward;* Wistman's Wood, *Rev. W. S. Hore;* Banks of the Plym, Lynmouth, *Rev. J. M. Chanter;* Shaugh Bridge, Vixen Tor, Great Mist Tor, White Tor, Longaford Tor, and Sheep's Tor, Dartmoor, *R. J. Gray;* Coxe's Tor, Dartmoor, about five miles from Tavistock, very fine, *G. Maw;* Tynemouth; Bickleigh Wood, *Miss Griffiths;* Dunsford Bridge; Ludleigh.

Severn.—Staffordshire: Gradbitch, near Flash. Shropshire: Treflach Wood, near Oswestry.

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Mersey.—Lancashire: near Bury, *Dr. Wood;* near Lancaster, *T. Simpson;* Thevilly, near Burnley, *S. Gibson.*

Humber.—Yorkshire: Turner's Clough, near Halifax, *S. Gibson*; Rishworth; Hawl Gill, near Mickleton; Lower Harrowgate, *J. Backhouse;* Foal Foot, Ingleborough, *Bolton;* Greenfield, near Saddleworth, *W. Wilson.*

Tyne.—Northumberland: Jurionside.

Lakes.—Westmoreland: Patterdale; Stock Gill Force, *Miss Beever;* Dungeon Gill, Langdale Pikes; Ambleside, *J. Bowerbank,* &c. Cumberland: Keswick; Bow Fell; Black Rocks, Great End, Scaw Fell; Borrowdale; Ennerdale, *Dr. Dickinson;* Scale Force, near Buttermere, *H. C. Watson;* Honister Crag, *Rev. G. Pinder;* Lodore Fall, *Miss Wright;* High Still, *Rev. G. Pinder;* Gatesgarth Dale; Dalegarth, *J. Robson,* &c. N. Lancashire: near Hawkeshead, *Miss S. Cowburn;* near Conistone, *Miss Beever;* Old Man Mountain, Silverdale, *Miss Beever.*

S. Wales.—Glamorganshire: below Melincourt Waterfall; rocks near Scud-einon Gam, *E. Young.* Brecknockshire: Ystrad-y-Ffin, and Llanwrtyd, *T. H. Thomas.* Cardiganshire: Pont Bren, *E. Lees;* Devil's Bridge, *W. H. Purchas;* Hafod. Carmarthenshire.

N. Wales.—Montgomeryshire: rocks near the Rhydol, *E. Lees.* Merionethshire: Dolgelly; Rhaiadr Du, near Maentwrog; Rhaidr-y-Mawddach, near Llaneltyd; Festiniog, *H. C. Rothery.* Carnarvonshire: Cwm Idwal, and throughout the Snowdon district: Rhaidr-y-Wenol, Falls of the Llugwy, Capel Curig, Rhaiadr Mawr, Llanberris; Twll-du, *W. Wilson*; Nant-Frangon, &c.

W. Lowlands.—Dumfries-shire: Delvine Pass; Nithside; near Penpont; Grey Mare's Tail, Moffat Dale, *P. Gray;* Girpel Lane, Kirkpatrick-juxta, *C. C. Babington.* Kirkcudbrightshire. Ayrshire: Glen Ness, W. Dalmellington, *Dr. M'Nab.* Renfrewshire: rocks above Gourock, *W. Gourlie.*

E. Lowlands.—Peebles-shire.

E. Highlands.—Stirlingshire: Stirling, *Mrs. Macleod.* Forfarshire: by the Reeky Linn, on the Isla. Clackmannanshire: Castle Campbell, Dollar. Perthshire: Glen Queich in the Ochils; Ben Lawers, *W. Gourlie;* Pass of Leny, *W. Gardiner*; Finlarig Burn, near Killin, *W. Wilson;* Trosachs; shores of Loch Katrine, *T. M.*

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W. Highlands.—Argyleshire: Crinnan, *C. C. Babington;* Glen Moray; Dunoon; Glen Gilp, Ardrishiag, *C. M'Intosh;* Glen Finnart. Dumbartonshire: Loch Lomond, *W. Gourlie;* Bowling Hills, *W. G.* Isle of Mull: Ben More; Loch Spelvie, *J. T. Syme;* Tobermorey. Islay. Arran: Glen Cloy, *Dr. Balfour.*

N. Highlands.—Ross-shire: Loch Alsh, *Miss E. Mahy.* Sutherlandshire.

N. Isles.—Shetland: near Ska, Unst. Orkney: Hoy, *R. Heddell.*

W. Isles.—Langa, Harris, *Dr. Balfour.*

Ulster.—Tyrone: Gortin Gap, *J. R. Kinahan.* Antrim: by the Glenarve River, near Cushendall; Colin Glen, Belfast. Londonderry. Donegal: Ennishowen Mountains, *W. Thompson;* Tullaghmore Park, *W. T.* Down: Mourne Mountains. Fermanagh: Florence Court, *Hon. J. L. Cole.*

Connaught.—Galway: Connemara, *Dr. Mackay;* Oughterard, Marm, Roundstone, &c. Mountains of Mayo, *J. Ball.*

Leinster.—Dublin: Kelly's Glen, *W. Andrews.* Wicklow: Glendalough; Hermitage Glen; Powerscourt Waterfall; Glencree, Great Sugarloaf, *J. R. Kinahan.*

Munster.—Tipperary: Morgan's Glen, Clonmel, *E. H. Sargint;* Glens near Youghal, *E. Newman.* Cork. Kerry: Great Blanket Island, Killarney; Valentine Island, *J. R. Kinahan;* ascending to the summits of trees in the Kerry mountains, *E. Newman.*

This plant is found in the north of Europe, in Norway, and the Faröe Islands: and is probably generally dispersed over Europe. We have met with no Asiatic specimens. It is, however, found in Bourbon, and with the segments narrower in South Africa. It is again met with in Tierra del Fuego, at Valdivia, Cape Horn, and in the Falkland Islands. It is also found abundantly in Tasmania, and less frequently in New Zealand.

The cultivation of the Film Ferns is an object of much interest to the fanciers of British Ferns. We have under our former species given some instructions on the subject.

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Genus XVII: **OSMUNDA**, *Linnæus.*

Gen. Char.—**Fructifications** paniculate, terminal or lateral on contracted rachiform portions of the fronds, or occupying distinct contracted fronds. **Spore-cases** crowded on the margins or over the surface of the segments, obovate-globose, pedicellate or sessile, having near the apex an incomplete or rudimentary gibbous ring, (represented by a few parallel striæ), at length bursting vertically in two equal hemispherical valves. **Veins** forked, from a central costa; **venules** free.

Fronds coriaceous or herbaceous, pinnate or bipinnate, the pinnæ or segments often articulated; the fertile parts contracted, usually rachiform, simple or compound, terminal medial or basal on the fronds, or sometimes occupying distinct contracted fronds.

Rhizome caudiciform or tufted.

The structure of the fructification in this genus, is quite dissimilar to that of all those which have preceded it. The spore-cases instead of being completely girt by a jointed ring, which is vertical in one group and oblique in another, have only some rudimentary indications of the ring on their upper part, these consisting of a few longish cells placed side by side. The spore-cases, moreover, burst vertically and separate into regular valves. When to this is added, that in the British species, the fructification is collected into a kind of inflorescence at the upper end of the frond, there can be no difficulty in recognising the plant when it comes under examination.

The genus, however, which is dispersed over the temperate regions of both hemispheres, and is not very prolific of species, presents some differences of character which serve for sectional distinctions. The groups we have adopted, are:—§ *Euosmunda*, typical of the genus, having the panicles terminal, the upper pinnæ being transformed and sporangiferous, represented by the native *O. regalis*; § *Plenasium*, having the lateral pinnæ transformed and

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sporangiferous, represented by the eastern *O. javanica*, and the western *O. Claytoniana*; and § *Osmundastrum*, having the fertile and sterile fronds distinct, represented by the North American *O. cinnamomea*.

There are many versions of the derivation of the name, all of which seem to be speculative. It has been said to come from the Saxon *osmund*, domestic peace: from *os* house and *mund* peace. Others have derived it from *osmundare* to wash the mouth, but the application is not obvious. According to others again, it is commemorative of Osmund a waterman of Loch Tyne, who if the legend may be depended on, hid his wife and fair-haired daughter on an island of the lake, covered with these plants, during an incursion of the Danes.

BRITISH SPECIES AND VARIETY.

O. regalis: a tall growing bipinnate aquatic perennial with terminal inflorescence-like fructification.

var. **cristata**: fronds pinnæ and pinnules multifid-crisped at the apex.

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THE ROYAL, or FLOWERING FERN.

OSMUNDA REGALIS.

O. fronds bipinnate (rarely tripinnate); pinnules oblong, nearly entire, dilated and more or less auricled at the base; spore-cases clustered in twice-branched panicles at the apex of the fronds. [Plate CX.]

OSMUNDA REGALIS, *Linnæus, Sp. Plant.* 1521. *Bolton, Fil. Brit.* 6, t. 5. *Smith, Eng. Bot.* iii. t. 209; *Id., Eng. Fl.* 2 ed. iv. 314. *Hooker & Arnott, Brit. Fl.* 7 ed. 593. *Hooker, Fl. Lond.* v. t. 150 (veins erroneous); *Id., Gen. Fil.* t. 46 A. *Mackay, Fl. Hib.* 345. *Gray, Nat. Arr. Brit. Pl.* ii. 3. *Babington, Man. Brit. Bot.* 4 ed. 429. *Newman, Hist. Brit. Ferns,* 3 ed. 307. *Moore, Handb. Brit. Ferns,* 3 ed. 268; *Id., Ferns of Gt. Brit. Nature Printed,* t. 50. *Deakin, Florigr. Brit.* iv. 36, fig. 1578. *Sowerby, Ferns of Gt. Brit.* 78, t. 44. *Bentham, Handb. Brit. Fl.* 625. *Schkuhr, Krypt. Gew.* 147, t. 145. *Swartz, Syn. Fil.* 160. *Willdenow, Sp. Plant.* v. 97. *Sprengel, Syst. Veg.* iv. 24. *Presl, Supp. Tent. Pterid.* 62. *Nyman, Syllog. Fl. Europ.* 434. *Fl. Danica,* t. 217. *Svensk Bot.* t. 366. *Ledebour, Fl. Ross.* iv. 506. *Fries, Sum. Veg.* 83. *Koch, Syn.* 2 ed. 973. *Gray, Bot. North United States,* 2 ed. 600. *Sturm, Fl.* (Farrn.) t. 7. *Lowe, Nat. Hist. Ferns,* viii. t. 3.

APHYLLOCALPA REGALIS, *Cavanilles, Ann. Cienc. Nat.* v. 164; *Id., Prælect.* (1802), 556.

STRUTHIOPTERIS REGALIS, *Bernhardi, Schrad. Journ. Bot.* 1800, ii. 126.

Var. **cristata**: fronds pinnæ and pinnules multifid-crisped at the apex. [Plate CXI.]

Caudex stout, firm, growing in tufts, dark-coloured, erect, often becoming trunk-like, and attaining an elevation of two feet or more. *Fibres* numerous, stout, branched.

Vernation circinate.

Stipes nearly or quite as long as the leafy portion of the frond, and as well as the *rachis* succulent tinged with red and clothed with loose deciduous pale-brown cobwebby wool while young, firm smooth and pale green when mature, terete, somewhat flattened in front, dilated at the base and having a membranaceous margin there;

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terminal and adherent to the caudex. *Secondary rachides* channelled and margined in front.

Fronds numerous, erect or sometimes arching, variable in height: two to four feet in dryish exposed localities, six to eight or even occasionally ten to twelve feet in very damp sheltered spots; membranaceous, smooth, bright yellow-green, paler beneath, broadly-lanceolate, bipinnate, occasionally tripinnate. Some of the fronds are entirely barren, while others have several of the upper pinnæ transformed into a terminal fertile panicle. *Pinnæ* (sterile) nearly opposite, lanceolate or ovate-lanceolate, impari-pinnate, distant. *Pinnules* opposite or alternate, one to two and a half inches long, sessile, oblong or oblong-ovate, obtuse, sometimes slightly falcate, rounded or somewhat dilated at the base especially on the posterior side, sometimes distinctly auricled, occasionally deeply lobed or sub-pinnate; the terminal ones, which are more acute than the rest, are usually lobed at the base; the margins are obscurely crenated, or sometimes serrated.

Venation of the sterile pinnules consisting of a stout *costa* or mid-vein giving off nearly opposite *veins*, which are forked once near their base, the *venules* being parallel, slightly curved, and once or twice forked before reaching the margin in which they are lost.

Fructification consisting of the upper pinnæ (usually wholly, sometimes only in part) changed into a bipinnated panicle of contracted rachiform capsuliferous divisions. Each short spike-like branch of this panicle represents one of the pinnules, the spore-cases being collected on it into little more or less evident nodules, and the nodules corresponding to the fascicles of the veins. This becomes at once evident in the case of partially transformed pinnules. *Spore-cases* subglobose, reddish-brown, reticulated, shortly-stalked, two-valved, opening vertically. *Spores* smoothish, globose or oblong with a central depression, yellowish.

Duration. The caudex is perennial. The fronds are annual, growing up very rapidly early in May. The panicles reach maturity early in summer and soon decay, and the fronds themselves are destroyed by the autumnal frosts.

This, the most stately of the British Ferns, is well deserving the

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regal name assigned to it. The plant is at once known from all the other native species, by its fertile panicle terminating the otherwise leafy fronds. There is moreover abundant technical distinction in the structure of its spore-cases.

The Flowering Fern, also known as the Osmund Royal, which is, as Dr. Deakin well remarks, the prince among the existing British race, grows naturally in wet, springy, or boggy places—

> "Auld Botany Ben was wont to jog
> Thro' rotten slough and quagmire bog,
> Or brimfull dikes and marshes dank
> Where Jack-o'-lanterns play and prank,
> To seek a cryptogamic store
> Of carex, moss, and fungus hoar,
> Of ferns and brakes and such like sights
> As tempt the scientific wights
> On winter's day: but most his joy
> Was finding what's called Osman Roy."

The species is widely and plentifully dispersed, scattered here and there in suitable localities, the whole length and breadth of Britain from Cornwall and Suffolk, to Sutherland, Shetland, and the Western Isles; it is abundant in many parts of Ireland; and is found in the Island of Jersey. Mr. Watson notices that it flourishes on the sea-shore sometimes only just above high-water line, and that it is seldom seen much above the sea-level in England; it does however reach an elevation of 300 to 600 feet. Dr. Kinahan mentions that in Ireland where it is most luxuriant in the west and south, especially near the sea, a stunted form of it grows down within the high tidal line. The principal recorded habitats are given in the following list:—

Peninsula.—Cornwall: banks of the Tamar near Newbridge, *G. Maw;* Goonhilly Downs near St. Ives; Penryn, *G. Dawson;* common in the low boggy parts of the country. Devonshire: Dawlish; between Budleigh and Exmouth; Watermouth, near Ilfracombe; Holme Chase, near Ashburton; Stoke near Hartland, *G. Maw;* Chudleigh on the banks of the Teign; Ivy Bridge on the Erme; Marwood, *Rev. F. Mules.* Somersetshire.

Channel.—Hampshire: frequent in the west. Isle of Wight, *Rev. G. E. Smith.* Dorsetshire: Isle of Purbeck, *T. B. Salter.*

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Wiltshire. Sussex: Tunbridge; Uckfield; Buxton Park; West Hoathly.

Thames.—Middlesex: formerly on Hampstead Heath. Surrey: Devil's Punch Bowl, Thursley, *J. D. Salmon;* Hindhead; Hambledon Heath; Cæsar's Camp, Farnham; Chobham, *T. M.;* Bagshot Heath, *J. Lloyd;* Frimley, *H. C. Watson;* Esher, *H. C. W.;* Wimbledon Common; Merivale Wood, Leith Hill, *E. T. Bennett,* and elsewhere about Dorking, *W. Pamplin;* Reigate, *H. M. Holmes.* Berkshire. Buckinghamshire. Essex: Kavanagh Wood, near Brentwood, *Gerarde;* Great Warley and Little Warley, *R. Castle;* Little Baddow; Epping.

Ouse.—Suffolk. Norfolk, *Miss Bell;* Caistor, near Yarmouth, *D. Stock;* Horning Ferry, *W. J. West.* Cambridgeshire: formerly at Gamlingay. Bedfordshire.

Severn.—Warwickshire: Arbury; near Birmingham, and elsewhere. Monmouthshire: Cwm-bran, *T. H. Thomas.* Herefordshire, *E. Williams.* Worcestershire: near Stourport, *Mr. Williams;* near Kidderminster and elsewhere. Staffordshire. Shropshire: Ellesmere Lakes, *Rev. W. A. Leighton;* Whitchurch, *R. W. Rawson;* West Felton, *Rev. W. A. Leighton;* Dairley Dingle, near Broseley, *G. Maw.*

Trent.—Leicestershire. Nottinghamshire: Mansfield; Bullwell, *T. H. Cooper.*

Mersey.—Cheshire: Lindon Moss; near Mobberly; Wybunbury Moss, *G. Maw.* Lancashire: Speke, near Liverpool, *T. B. Hall;* Chat Moss, *W. Christy;* Woolston Moss and elsewhere near Warrington, *W. Wilson;* Poulton-le-Sand.

Humber.—Yorkshire: Pottery Carr, near Doncaster, *S. Appleby;* near Leeds; Askham Bog; Whitby; Wheldrake, *T. Simpson;* York, and other parts.

Tyne.—Durham: Teesdale. Northumberland: Chivington Woods, *Rev. R. Taylor.*

Lakes.—Westmoreland: Windermere, *T. G. Rylands;* Colwith, *H. Fordham.* Cumberland: Sea Scale, Gofsorth, *J. Robson.* Isle of Man, *E. Forbes.*

S. Wales.—Glamorganshire: Swansea, *G. Lawson.* Pembrokeshire: Fishguard, *E. Lees.* Carmarthenshire.

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N. Wales.—Anglesea. Denbighshire. Merionethshire: Barmouth; Falls of the Cynvael, near Festiniog. Flintshire: Loughton Bog, *Dr. Bidwell.* Carnarvonshire: Llandudno, *T. Baxter.*

W. Lowlands.—Dumfries-shire: Lochar Moss, *W. G. Johnstone.* Kirkcudbrightshire: by the Manse or White Loch, and below the Cliffs, Colvend, *P. Gray.* Lanarkshire: by the Clyde.

E. Highlands.—Stirlingshire. Fifeshire. Kincardineshire coast, *Dr. Murray.* Perthshire: Culross; by Loch Tay, *C. M'Intosh.* Forfarshire: Arbroath, *G. Lawson;* Montrose; Kinnaird, &c. Aberdeenshire: Mill of Leys, *G. Dickie,* and elsewhere.

W. Highlands.—Argyleshire: Glen Finnart; Dunoon; Loch Fine, N.E. of Inverary, *H. C. Watson.* Dumbartonshire: by Loch Lomond, *H. C. Watson.* Isles of Arran, Bute, Mull and Islay.

N. Highlands.—Sutherlandshire: Inchnedamff, *Dr. Johnston.* Ross-shire.

N. Isles.—Shetland.

W. Isles.—N. Uist. Harris. Lewis.

Ulster.—Donegal: near Lough Eske, *R. Barrington.*

Connaught.—Galway: abundant in Connemara; Kylemore, *R. Barrington;* Oughterard; Bog near Lough Coota, *J. R. Kinahan.* Mayo: Castlebar, *Dr. Osborne.* Island of Achill, *E. Newman;* Foot of Slieve More near Dugort, *R. Barrington.*

Leinster.—Dublin: Kelly's Glen, *Dr. Mackay.* King's County: All Saints' Bog, rare, *J. R. Kinahan.* Wicklow: Devil's Glen, rare, *J. R. Kinahan.*

Munster—Cork: Bandon. Kerry: Letterfrack, near Ballinaskellig's Bay; Mucruss Abbey, Killarney, common, *J. R. Kinahan.* Waterford: Portlaw; Glandine, and Carthy's Cove, near Ardmore, *J. R. Kinahan;* Clonmel, frequent, *J. Sibbald.* Tipperary. Clare: Lough-a-torrig, near Woodford, *J. R. Kinahan;* Lisdoonvarna, *R. Barrington.*

Channel Isles.—Jersey.

This Fern is common throughout Europe, being recorded from Sweden, Gothland, Denmark, Russia, Holland, Belgium, France, Switzerland, Germany, Spain, Portugal, Italy, Hungary, Croatia, Transylvania, and Turkey. In Asia, it is found in Mingrelia; and

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in India: in the Concan, the Neilgherries (narrow pinnuled form), Kumaon, and in the Himalayas. In Africa, it occurs in the Azores, in Algeria, in South Africa and Natal (narrow pinnuled form), and in Madagascar. In North America, it is found in Newfoundland, Canada (with narrow pinnules), in Saskatchawan, and in the United States. It is also met with in North-west Mexico; and in the country of the Rio Grande in Brazil. Both North and South America also yield other very similar plants, which are probably to be regarded as distinct varieties of this species. One of the most striking and elegant of these, is the *O. spectabilis* of North America, which may be known by its smaller size, and smoother sub-glaucous surface. Another, the *O. palustris* of Schrader, from Brazil, Mexico, and New Grenada, is a more rigid and larger plant, but with narrow and numerous pinnules. The Indian *O. speciosa*, which appears to be the same as *O. japonica*, has the aspect of *O. regalis* in its barren fronds, but differs essentially in producing the fertile fronds distinct from the sterile ones.

The *Osmunda* is a very handsome plant under all circumstances, but it is especially beautiful when, in very luxuriant growth, its fronds, loaded at their tips by the fertile panicles, are bent down gracefully until they almost reach the surface of the water by the side of which they are growing. Hence it should always find a place in cultivated collections. It is of easy culture, requiring much moisture, and preferring a peaty soil. By the margin of lakes or streams, or at the base of a rockery abutting on an artificial bog or pool, the *Osmunda* would find itself at home; and no special culture would be necessary. Like most other Ferns it grows finest in sheltered places. It may be increased by dividing the tufts; but it is by far the best plan, in planting such species as the present, to procure vigorous masses from the localities where they are spontaneous, as an immediate effect is thus obtained which it would take years to produce by the ordinary rate of enlargement.

The caudex of this Fern is said to possess tonic and styptic properties, but it has fallen into disuse. According to Gerarde the 'root' boiled or stamped and taken with some kind of liquor is "thought to be good for those that are wounded dry-beaten and bruised." Mr.

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Newman states on the authority of Mr. Buchanan, that it is collected in Cumberland under the name of 'bog onion,' and extensively used as a vulnerary. It also appears* that in Westmoreland and the adjoining part of Lancashire, where the plant is vulgarly known under the name of 'bog onion,' the caudices are held in high popular esteem as an external application for bruises, sprains, &c. The caudices are beaten, covered with "cold spring water," and allowed to macerate all night, and the thick starchy fluid thus formed, is used to bathe the parts affected.

Though very variable in size, this species does not present much variation in structure. One or two exceedingly interesting varieties, however, occur, especially that first mentioned below :—

1. *cristata* (M.). This form is extremely handsome, and as yet unique. The frond before us, is two feet high excluding the stipes, and nearly one and a half foot broad, bluntly ovate in outline, bipinnate, the rachis forked, the apex multifid crisped. The pinnæ are developed at their apices into a large fan-shaped or spreading crispy tuft; the pinnules are one and a half to two inches long, irregularly toothed with projecting lobes along their sides, and dilated and multifidly-lobed at the ends. The fronds present the multifid-crisped character in a very marked degree, and have a very beautiful appearance. It is in the possession of Messrs. Osborn and Sons of Fulham, and was accidentally purchased by them when in the dormant state, amongst a batch of plants obtained from a hawker. The wild locality is unknown. Our figure represents one of the moderate sized pinnæ, and may be taken also to represent the more usual size of the species itself, of which latter the figure, owing to our limited page, is taken from an unusually small specimen, selected in order to show a whole frond. [Plate CXI.]

2. *interrupta* (M.). We have only seen a fragment of this form, communicated by Mr. Sim of Footscray. In this, the pinnules are mostly reduced to a roundish flabellate form, one or two here and there being of the usual or normal character.

* *Phytologist*, v. 30.

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Genus XVIII: **BOTRYCHIUM,** *Swartz.*

Gen. Char.—**Fructifications** paniculate, formed of numerous secund spikelets, on a distinct branch of the frond. **Spore-cases** erect, biserial, sessile, globose, fleshy-coriaceous, ringless, bursting equally in two equal hemispherical valves. **Veins** flabellate-dichotomous, or dichotomo-furcate from a central costa; **venules** free.

Fronds herbaceous or sub-carnose, the sterile and fertile branches distinct, the branches pinnatifid pinnate or ternately decompound.

Caudex cormiform, short, erect, fleshy.

The genus *Botrychium*, belongs to the *Ophioglossaceæ*, a distinct group of Ferns from any we have been considering, distinguished primarily by having the spore-cases altogether ringless, and by having the fronds straight in vernation, that is to say, folded flat in the embryo state, and not curled in a circinate manner, as is almost universal in the family of Ferns.

Of this group we have two British genera, *Botrychium* and *Ophioglossum*, the native species of which are readily distinguishable from each other by their external features. Both genera have two-branched fronds, one branch forming, as it were, the leaf, and the other the inflorescence-like fructification; but they differ obviously in this, that *Botrychium* has its branches again branched, while the branches in *Ophioglossum* are simple or undivided.

Mr. Newman has very well described in the following passage,* the mode in which these interesting plants are developed:—"The roots and caudex of *Botrychium* differ essentially from those of true Ferns. The roots are stout, succulent, and brittle. The caudex is about the same size as the roots, perhaps rather stouter; it descends perpendicularly, and the roots issue from it at right angles. Before the plant has felt the influence of spring, the frond exists in

* Newman, *History of British Ferns*, 3 ed. 315.

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a quiescent state, but perfectly formed. It then appears like a simple stem, scarcely an inch in length, and perfectly erect. On a closer inspection the component parts of the future frond will be clearly perceived; the stipes is swollen, and rather stouter than the upper part, the two branches of which face each other, the fertile branch of the frond being clasped by the barren or leafy part; and, the fructification being thus entirely concealed, the uppermost pinnæ are incurved, as if to give still further protection to the fruit. The whole is invested and completely enclosed in scale-like alternate sheaths, doubtless the decaying stalks of many previous years. As the spring advances, the frond rapidly increases in size, until in April it makes its appearance above ground, and in May or June attains its perfect development."

The species of *Botrychium* are few in number, distributed over the temperate regions of the northern hemisphere, and more sparingly in the southern. They are all plants of interesting character.

The name of the genus is derived from *botrys*, a bunch or cluster of grapes, which the branched clusters of spore-cases somewhat resemble in outline. The English name, Moonwort, is derived from the lunate form of the pinnæ in the British species.

BRITISH SPECIES AND VARIETIES.

B. Lunaria: a dwarf perennial with two-branched compound fronds; the barren branch oblong pinnate, the pinnæ lunate.

var. **rutaceum**: barren branch deltoid pinnate, the pinnæ linear oblong inciso-serrate or pinnatifid, with the ultimate lobes bifid or trifid.

var. **tripartitum**: barren branch deltoid, three-parted; the divisions pinnate with lunate pinnæ.

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THE COMMON MOONWORT.

BOTRYCHIUM LUNARIA.

B. fronds solitary; barren branch oblong pinnate; pinnæ lunate or fan-shaped, the margin jagged or crenate. [Plate CXII.]

BOTRYCHIUM LUNARIA, *Swartz, Schrad. Journ. Bot.* 1800, ii. 110; *Id., Syn. Fil.* 171. *Smith, Eng. Fl.* 2 ed. iv. 315. *Hooker, Fl. Lond.* iv. t. 66; *Id., Gen. Fil.* t. 47 A. *Hooker & Arnott, Brit. Fl.* 7 ed. 594. *Mackay, Fl. Hib.* 346. *Babington, Man. Brit. Bot.* 4 ed. 429. *Deakin, Florigr. Brit.* iv. 34, fig. 1577. *Newman, Brit. Ferns,* 3 ed. 313. *Moore, Handb. Brit. Ferns,* 3 ed. 271; *Id., Ferns of Gt. Brit. Nature Print.* t. 51 A. *Sowerby, Ferns of Gt. Brit.* 79, t. 45. *Bentham, Handb. Brit. Fl.* 624. *Lowe, Nat. Hist. Ferns,* vii. t. 66 A. *Schkuhr, Krypt. Gew.* 156, t. 154. *Willdenow, Sp. Plant.* v. 61. *Sprengel, Syst. Veg.* iv. 23. *Presl, Supp. Tent. Pterid.* 43. *Nyman, Syll. Fl. Europ.* 434. *Ledebour, Fl. Ross.* iv. 504. *Koch, Syn.* 2 ed. 972. *Svensk Bot.* t. 372, fig. 1. *Milde, Nov. Act. N. C.* xxvi. pt. 2, 657, tt. 47, 48.

BOTRYCHIUM LUNATUM, *Gray, Nat. Arr. Brit. Pl.* ii. 19.

BOTRYPUS LUNARIA, *Richard, Cat. Med.* (Paris 1801) 120.

OSMUNDA LUNARIA, *Linnæus, Sp. Plant.* 1519. *Bolton, Fil.* 4, t. 4. *Smith, Eng. Bot.* v. t. 318. *Fl. Dan.* t. 18, fig 1. *Sturm, Fl.* (Farrn.) t. 12.

OSMUNDA LUNATA, *Salisbury, Prod.* 401.

OPHIOGLOSSUM PENNATUM, *Lamarck, Fl. Franç.* i. 9.

Var. **rutaceum**; barren branch deltoid, pinnate; pinnæ linear oblong inciso-serrate, or pinnatifid with the ultimate lobes 2-3-fid.

BOTRYCHIUM LUNARIA, *v.* RUTACEUM, *Moore, Ferns of Gt. Brit. Nature Printed,* under t. 51 A; *Id., Handb. Brit. Ferns,* 3 ed. 271.

BOTRYCHIUM LUNARIA, *b. Smith, Eng. Fl.* 2 ed. iv. 315.

BOTRYCHIUM RUTACEUM, *Swartz, Schrad. Journ.* 1800, ii. 110 in part; *Id., Syn. Fil.* 171, in part. *Willdenow, Sp. Plant.* v. 62. *Schkuhr, Krypt. Gew.* 157, t. 155, fig. *b.* (excl. fig. *a.*) *Presl, Supp. Tent.* 44. *Newman, Hist. Brit. Ferns,* 3 ed. 320. *Babington, Man. Brit. Bot.* 4 ed. 429. *Ledebour, Fl. Ross.* iv. 505.

BOTRYCHIUM MATRICARIÆFOLIUM, *A. Braun, Koch, Syn.* 2 ed. 972. *Woods Tour. Fl.* 426. *Milde, Nov. Act. N. C.* xxvi. pt. 2, 679, tt. 51, 52.

BOTRYCHIUM LANCEOLATUM, *Ruprecht, Dist. Crypt. Ross.* 33; ? Angström and Milde.

OSMUNDA LUNARIA, *β.* RAMOSA, *Roth, Fl. Germ.* iii. 32.

Var. **tripartitum**: barren branch deltoid, three parted; division or branches pinnate, with lunate pinnæ.

BOTRYCHIUM LUNARIA, *v.* CRISTATUM, *Kinahan, Proc. Dublin Nat. Hist. Soc.* 1855-6, 26 (reprinted from the *Dublin Nat. Hist. Rev.* iii.) t. 5.

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Caudex or *Corm-like Crown* forming a small scarcely thickened wiry-rooted descending axis (rhizome, *Presl*), terminated by a bud or growing point, enclosed by brown membranaceous sheaths. *Roots* stoutish, fleshy, brittle, branched and elongated, spreading irregularly from about the crown; and branching in a somewhat whorled manner from the perpendicular axis beneath the crown; some of the stouter of these roots probably organise new crowns, as in the case of *Ophioglossum*. When at rest, the plant consists of this crown or bud or growing point, seated among the wiry roots, enclosing the incipient or rudimentary fronds, and encased by membranaceous sheaths.

Vernation plicate or folded straight, the fertile branch clasped by the sterile one.

Stipes erect, smooth, cylindrical, hollow, succulent, having about four vascular bundles embedded in its tissue, its base surrounded by long brown sheaths, which are doubtless the persistent bases of former fronds, usually about half the height of the entire frond, dividing at top into two branches, of which one is leafy, the other fertile.

Fronds from two to eight or ten inches high, including the stipites, firm, stout, fleshy. *Sterile branch* smooth, dark green, pinnate, with four to six or seven pairs of *pinnæ*, which are flabellate or lunate, the margins nearly entire, or somewhat crenate. *Fertile branch* pinnate or bipinnate; the narrow rachiform spikelets (whether answering to pinnæ or pinnules) fleshy, flattened, and bearing on the inner face or that towards the sterile branch a double row of erect spore-cases, so that these spikelets are secund, and they are moreover more or less incurved, or suberect. Sometimes more than one fertile branch is produced, and occasionally spore-cases are developed on the edges or surface of the barren pinnæ.

Venation of the barren pinnæ flabellate-furcate, *i. e.* the vein enters at the base, and becomes forked over and over again until the whole space is traversed by the contiguous slightly radiating *veins* and *venules*, which do not extend quite to the margin.

Fructification occupying the flattened rachiform divisions of the separate fertile branch of the frond. *Spore-cases* sessile, standing erect, *i. e.* at a right angle to the plane of the segments, in two

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rows along each of these segments near the margin, smooth, spherical, without any apparent ring or reticulations, two-valved, bursting transversely, golden brown when mature. *Spores* smooth, roundish more or less triangular, pale-coloured.

Duration. The crowns and roots are doubtless perennial. The fronds are annual, growing up in April or May, and becoming fully grown in June, afterwards gradually drying up and perishing with the summer's drought.

The ordinary state of the Moonwort may be known by the double row of fan-shaped pinnæ which form the sterile branch of its frond. It is not easily distinguished from the herbage among which it grows, and on that account is probably often passed over without recognition. Mr. Wilson, long since, observed that within the stem of the growing frond, at its base, the frond for the ensuing year is enclosed, and again within this, also at its base, the frond for the next following year. Mr. Newman also, who subsequently examined an abundant supply of specimens, found the frond of the ensuing year in every respect perfectly formed, indeed, exactly in the state in which it is found in the early spring before development; while the frond for the next following year, though less perfectly formed, also had the fruitful and leafy portions distinct from each other. These observations being made in May, while the plant was still growing, the fronds for three successive years were distinguishable at the same time.

A widely-diffused, but local species, found here and there over the whole of England, Wales, and Scotland, extending to the Islands of Orkney and Shetland. It has been less frequently found in Ireland, but is reported thence from all the provinces. It is found in dry open elevated pastures and waste lands, generally skirting the bushes which occur in such localities. Though abundant in some of its habitats, and general in its distribution, it can hardly be considered as a common species. Its altitudinal range is stated to extend from the coast level to an elevation of nearly 3000 feet above the sea. The plant referred to *rutaceum* has been gathered on the sands of Barry, Forfarshire. Mr. Newman gives Westmoreland

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as another habitat, supposing the plant to be the *Lunaria minor foliis dissectis* of Ray, which was found in that county; but Dr. Kinahan suggests that this is identical with our var. *tripartitum*. The following are some of the recorded stations of the species:—

Peninsula.—Cornwall: Cardynham, *Mrs. Grylls.* Devonshire: near Barnstaple; by the Dart, *Mrs. Griffiths;* Little Haldon, rare, *R. J. Gray;* Westdown near Ilfracombe, *Rev. F. Mules.* Somersetshire: Bath; Shirehampton near Bristol, *T. B. Flower;* King's Weston; Hampton Cliffs, *R. Withers,* &c.

Channel.—Hampshire: Titchborne, *Mr. Forder;* New Alresford; S. W. of Petersfield, *W. Pamplin;* Somborne, near Winton; Hinton, &c. Isle of Wight: East end, between Bonchurch and Shanklin, *Dr. Bromfield.* Sussex: Storrington, *Rev. F. Fearon;* Patcham, *W. Borrer.* Croboro' Warren; Dudsland; near Cross-in-hand; Waldron; Burwash Common; Boxgrove Common, *E. Newman;* Hollingbury Hill, *W. Borrer,* &c. Wiltshire: Alderbury Common, *Dr. Maton;* near Bath, *C. C. Babington.* Dorsetshire: Sturminster Newton, *Pulteney.*

Thames.—Kent: Dartford, *H. L. Jenner;* Foot's Cray; Chislehurst, *Sherard;* and elsewhere in the south part. Surrey: Reigate, *G. Luxford;* Shere; Albury; Deepdene, near Dorking, *J. Nash;* Leith Hill, *W. Pamplin;* Abinger, *Mr. Jenner;* Shirley Common, near Croydon, *W. Pamplin;* Highdown Heath, near Godalming, *J. D. Salmon;* Farnham Park. Oxfordshire: North Leigh Heath, *Sibthorpe;* Shotover Hill, *W. Baxter;* Winchwood Forest, *Blackstone;* near Oxford, *Merrett.*

Ouse.—Bedfordshire: Oakley Westfield, *Abbot.* Suffolk: Bury, *D. Stock.* Norfolk: Heveringham Heath, *S. P. Woodward;* Stratton Heath, *Mr. Crowe;* Seething, *Mrs. Kett;* Moushold Heath near Norwich, *G. Smart;* Berg Apton, *S. P. Woodward.* Cambridgeshire: Little Linton, *C. C. Babington;* Balsham; Chippenham. Northamptonshire: Halston Heath; higher parts of the Wold Field, *Morton.*

Severn.—Warwickshire: Moxhall; near Coleshill Pool, *Mr. Murcott.* Gloucestershire. Monmouthshire: Twyn-gwyn, rare, *T. H. Thomas.* Herefordshire. Worcestershire: Abberly Hill, *Mrs. P.*

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Onslow; Oversley Hill, near Alcester; Stourbridge, *W. Hill;* south side of Breedon Hill, *Mr. Nash.* Staffordshire: Cheadle, *Mr. Carter;* elevated pasture, two miles from Farley abundant, *Mr. Carter.* Shropshire: Stollerton; Titterstone Clee Hill, *T. Westcombe;* Ludlow, *Dr. Evans;* Whitchurch.

Trent.—Rutland. Leicestershire: closes between Okeley Wood and Long Whatton; Loughborough; Market Harborough, *Pulteney;* near Ashby de la Zouch; Twycross, &c. Lincolnshire: Weelsby; Lincoln Heath, *Blackstone.* Nottingham: Sutton-on-Trent; Newstead; Clifton, cow pastures, *J. E. Sidebotham;* Paplewick, *J. Riley;* Norton; Eastwood; Fiskerton; Sherwood Forest, *T. H. Cooper.* Derbyshire: near Buxton, *H. C. Watson;* between High Peak and Sheffield, fine; Chinley Hill, near Chapel-le-Frith, *O. Sims;* Dethick; Masson, near Matlock.

Mersey.—Cheshire: near Over, large, *W. Wilson;* between Egremont and New Brighton, *H. E. Robson;* Alderley, *Rev. J. Bell;* Macclesfield, &c. Lancashire: Chilburn, near Todmorden, *S. Gibson;* Reddish, near Stockport, *Dr. Wood;* Greenfield, near Manchester, *J. Merrick;* Newton, *W. Wilson;* Oldham; Southport, *T. G. Rylands;* between Bootle and Crosby, *H. C. Watson;* Lancaster, *T. Simpson.*

Humber.—Yorkshire: Cronckley Fell, *C. C. Babington;* Hambleton Hills; Halifax; Richmond; Settle, common, *J. Tatham;* Pottery Car, near Doncaster, *S. Appleby;* meadows near Burniston, *T. Simpson;* Hutton Moor, *T. S.;* near Preston; Brightside; Kippax, *Rev. G. Pinder;* Midgley Moor, *S. Gibson;* Ganthorpe, near Castle Howard, *J. Backhouse;* Terrington Car; wood near Earswick; Low Harrogate; Cotherstone Fell, *H. Baines;* Knaresborough; Ripon; Sheffield, *F. Williamson,* and various other parts.

Tyne.—Northumberland: near Shewing Shields, *Winch;* Hexham; Horsley, Tyneside, *Rev. J. Bigge;* Tynemouth, *Miss Hancock;* Newcastle Town Moor, *R. Bowman.* Durham: Teesdale; Higher Tees, *J. Hogg;* fields near Marsden Rocks; moor above Beamish, *Winch.*

Lakes.—Cumberland: Braystones; Muncaster Fell; Keswick; Castle Sowerby; Naworth Park; Daleton; Flimby; Giggleswick;

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Newly Cross; near Aspatria, *Rev. J. Dodd*, &c. Westmoreland: Crosby Ravensworth, *R. Clarke;* Rigmaden, and elsewhere.

S. Wales.—Glamorganshire.

N. Wales.—Anglesea, in old pastures, *Rev. H. Davies.* Denbighshire: Wrexham, *J. E. Bowman;* Ruthin, *T. Pritchard;* pastures west of Chirk Castle, *Mr. Griffith.* Montgomeryshire: Craig Breidden, *Mr. Dovaston;* near Rodney's Pillar, *Rev. A. Bloxam.* Merionethshire: Barmouth. Carnarvonshire: Penmaen Mawr, *Ray.*

W. Lowlands.—Dumfries-shire: about Dumfries; Drumlanrig; Barhill, Tinwald, *P. Gray.* Kircudbrightshire: Dalscarith; Glen of Terregles; Douglas Hall, Colvend, *P. Gray;* and elsewhere. Wigtonshire: Portpatrick. Ayrshire. Lanarkshire: Cathkin Hills, *W. Gourlie.* Renfrewshire: Gourock, *W. Gourlie.*

E. Lowlands.—Berwickshire: Bernerside Hill, *W. Baird;* Blackburnrigg Dean; Coldingham Moor. Edinburghshire: Pentland Hills, *H. C. Watson;* and elsewhere. Linlithgowshire.

E. Highlands.—Clackmannanshire. Kinross-shire. Fifeshire. Perthshire: Fort at Taymouth Castle, *C. M'Intosh;* South side of Loch Tay, *H. C. Watson;* Craig Challiach, *H. C. W.;* Ben Lawers, *W. Gourlie;* Blair Athol, *W. Brand;* Roman Camp at Ardoch, *C. M'Intosh.* Forfarshire: Kingoldrum, *G. Lawson;* Clova Mountains, *H. C. Watson;* Sands of Barry (var. "*rutaceum*"); Montrose; Strickathrow, *A. Croall;* Arbroath, &c. Kincardineshire. Aberdeenshire: Belhelvie Links; Corsehill, &c. Banffshire: Mortlock. Morayshire: *Rev. G. Gordon.* Nairnshire: Auldean.

W. Highlands.—Argyleshire: Ardrishiag, *W. Brown;* Glen Croe. Dumbartonshire: Mugdock, *G. Gardiner.* Bute: Rothesay, *W. Gourlie.* Skye: Breeze Hill. Staffa, *T. B. Bell.*

N. Highlands.—Ross-shire. Caithness: Wick, rare, *T. Anderson.*

N. Isles.—Orkney, *Rev. C. Clouston.* Shetland.

Ulster.—Antrim: Roughfort; mountain pastures about Belfast. Altmore Glen, near Cushendall, *W. Thompson;* Knockagh, near Carrickfergus; Black Mountain. Londonderry: Benyvena Mountains, near Magelligan, *D. Moore.* Down: Scrabo, *Mr. Templeton.*

Leinster.—Wicklow: Luggelaw, and Powerscourt, *W. Thompson;* Scalp, *J. Bain;* Louth, *G. A. Pollock.* Dublin: Kilmashogue Hill, *J. R. Kinahan;* Kilnasantan and Cruagh Hills, *J. R. K.*

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Munster.—Tipperary: Clonmel, *J. Sibbald.* Kerry: Valentia Island, *Miss Helen Blackburne.*

Connaught.—Galway: Connemara, near Galway, *Lady S. De la Poer Trench.*

The Moonwort is reported to occur in various parts of Europe, from Iceland, North Cape, Lapland, and the other Scandinavian regions, to Holland, Belgium, France, Switzerland, Germany, Spain, Italy, Sicily, Dalmatia, Croatia, Hungary, Transylvania, and the Russo-Caucasian provinces. In Asia it grows in Sikkim and Kumaon in the Himalaya, and in Siberia, in the regions of the Ural and Altai Mountains and Lake Baikal, extending to Kamtschatka and Unalaschka. In North America: in Newfoundland, Greenland, Bear Lake, the Saskatchawan, and Rocky Mountains, to Behring's Strait in North West America. It also occurs in Fuegia, and in Tasmania; and has been recently met with by Dr. Müller on the Australian Alps, in Victoria. *B. rutaceum*, a native of the northern and central parts of Europe, though scarcely to be considered as a settled member of our Flora, is not unlikely to be so, the Forfarshire plant being apparently the same. The North Americo-European *B. simplex*, is intimately allied both to *B. Lunaria* and *B. rutaceum*, but is probably distinct.

No very marked success has been met with in cultivating the plants belonging to this genus. Mr. Newman regards them as underground parasites, which view is at least doubtful, as the plants have been dug out with the utmost care without any trace being discovered of adhesion to the roots of surrounding plants. The difficulty of growing them, is probably chiefly owing to the almost unavoidable fluctuations of moisture to which artificially-cultivated plants are subject, and which, judging from the natural sites in which the species is found, it is unable to bear. The best chances of success seem to be afforded by digging up the plants when ripening off, taking along with them sods of the natural soil large enough to enclose the roots uninjured, or by taking them at the dormant period, the position of the plants having of course been previously marked; and then in either case, to plant them in con-

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siderable masses of the same kind of soil as that from which they were taken, whether it be sandy loam or an unctuous peat, in both of which they occur. Care must be also taken to keep the soil cool, and moderately as well as equably moistened. The plan of transplanting at the dormant period is certainly most in accordance with theoretical notions of success. It is not improbable that the shade afforded by other herbage such as grass, to the surface of the soil, may be beneficial to the plants, by conducing to preserve an equable condition of the earth, both as regards warmth and moisture.

Mr. Newman takes a different view. "This is," he writes,* "the most easy of all ferns to cultivate, never refusing to grow freely if properly treated. First, dig up a large sod, where a few mature fronds are conspicuous amongst the grass; take care to have it broad enough and deep enough, so that not one of the roots of the *Botrychium* is exposed, much less injured: fit this sod in a large pot, a feeder, or even a box; place it in the open air, and be sure to add no compost, or rich vegetable soil. Keep the grass cut short with a pair of scissors, and water in dry weather, for the purpose of keeping the grass green and vigorous. Acting on the belief that *Botrychium* is a root-parasite, the only requisite is to keep the nurse-plant in vigorous health." We have already stated that we do not take this view of the habit of the plant, and we find our own opinion confirmed by that of a very keen observer, Dr. Kinahan, of Dublin, who writes†:— "The point of whether this plant is truly a plant-parasite or not has engaged my attention, and the only conclusion I can come to is, that there is no actual connection or contact between it and the plants among which it is found; which is the more strange, as it is evident from the nature of the localities in which it grows, and from the testimony of all the most successful cultivators of the plant, that it would not subsist unless amongst grass. Mr. Wollaston, than whom I know of none more competent to offer an opinion on any subject connected with the growth of ferns, has told me, that he finds that to keep the plant over the second year, it is absolutely necessary to grow it in a tuft of grass, and yet that he has never, even after the most searching examination, by washing out the soil from the roots of

* Newman, *History of British Ferns*, 3 ed. 318.

† Kinahan, in *Proceedings of Dublin Natural History Society* (session 1855-56), 28.

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plants, succeeded in tracing any connection between the plants; so that this must, I fear, be for the present classed among those botanica. puzzles which have baffled all our efforts for their unravelling."

The virtues of the Moonwort are doubtless more imaginary than real, but they have been held in high estimation, and the plant gathered by the light of the moon, was said to "doo wonders." According to Gerarde it is "singular to heale fresh wounds;" and both Gerarde and Ray regarded it as a remedy for dysentery. Besides these, the most wonderful magical properties were assigned to it. It is now, however, quite neglected as a remedial agent.

The *Botrychium* is not subject to much variation, but one or two tolerably distinct forms sometimes occur:—

1. *rutaceum* (M.). This plant, which is perhaps entitled to specific rank, differs in having a broad triangular twice-divided barren branch, which appears in fact as though it were a fertile branch of the common sort accidentally become barren and leafy, and also by the narrow elongate linear or oblong form of the secondary divisions, of which there are about three or four pairs. It has been found, very sparingly, on the sands of Barry near Dundee, and is also reported to have been found in Westmoreland. We have not seen a native specimen, but that from Dundee figured by Mr. Newman tolerably well agrees with the European *B. rutaceum*, which is by no means an unlikely plant to occur in Great Britain. We must however at present be content to regard it as a doubtful member of our Flora. The figure of Newman has been referred by Hooker and Arnott to *B. simplex;* but Dr. Milde who has paid much attention to the species of this genus identifies it with *B. rutaceum* of Willdenow (*matricariæfolium* of Braun) excluding, in part, the *rutaceum* of Swartz. Dr. Milde's own illustrations of *B. lanceolatum* (including *Fl. Dan.* t. 18, fig. dext.) are most nearly accordant with the figure of the Dundee plant, which should probably bear the name of var. *lanceolatum* instead of *rutaceum*, hitherto applied to it.

2. *tripartitum* (M.). This form, though like it producing deltoid barren branches to its fronds, is quite distinct from the plant above referred to. It differs from the normal state only in producing a

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barren branch with a three-parted instead of a single axis, its three branches in fact representing three small fronds of the ordinary state of the species. The lateral branches are rather smaller and less developed than the central one, thus producing an elongate deltoid outline, but the pinnules of all the branches are of the lunate or flabellate form characteristic of the species. It is hence no doubt a three-parted form of the common Moonwort; and it is curious to observe that the allied *B. simplex*, which in its more usual state has simple oblong barren branches, varies with the lower segments similarly developed into lateral branches, so as to produce tripartite fronds. It was found some years ago by Dr. Kinahan on Kilmashogue Hill in the county of Dublin, three plants being then found; two years later, on revisiting the spot, eight plants were observed having this peculiarity. Dr. Kinahan refers this curious variety to the *cristatum* series of variations, but it does not appear to us to present the peculiarities to which this term is applied among ferns, and we have therefore adopted the name *tripartitum;* he also suggests the possibility of this, instead of *rutaceum*, being the *Lunaria minor foliis dissectis* of Ray, but we should rather identify our next variety with Ray's plant, than either this or the preceding.

3. *incisum* (Milde). This form resembles the common state of the species in its general features, having the sterile branch oblong, and the pinnæ lunate; it differs in having the latter deeply incised so that their edges are cut into narrow segments. The plant is occasionally met with. Bolton records it from Halifax; Lowe (vii. t. 66 B.) figures it from Crosby Ravensworth under the name of *Moorei;* and Dr. Kinahan records it from Kilnasantan, Dublin, under the name of *laciniatum*. It is however the var. *incisum* of Milde, and is well figured in the illustrations to his paper on the Cryptogamous Flora of Silesia.

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Genus XIX: OPHIOGLOSSUM, *Linnæus.*

Gen. Char.—**Fructification** in a distichous spike, terminating a distinct branch of the frond, or on a distinct frond. **Spore-cases** uniserial along each margin of the compressed spike, with which they are connate, horizontal, globose, bursting in two equal hemispherical valves. **Veins** uniformly reticulated in roundish or elongated hexagonal areoles, sometimes from an indistinct costa, occasionally obscure; **veinlets** free, included in the ultimate areoles, sometimes wanting.

Fronds subcarnose, two- or many-branched; the sterile branch simple dichotomously parted or palmate-lobate, the fertile simple; the fronds sometimes simple, the sterile and fertile ones being distinct and dissimilar.

Caudex corm-like, fleshy, subglobose, or short cylindrical ovate.

The genus *Ophioglossum* is the type of the order *Ophioglossaceæ* already mentioned under the preceding genus as differing from the generality of Ferns, in having ringless spore-cases and straight vernation. The genus is itself allied to *Botrychium* in general habit, but differs in having the branches of its two kinds of fronds in the British species quite simple or undivided, instead of being pinnate and bipinnate respectively as they are in that genus. The principal distinction between the two genera, however, resides in the nature of the fertile branches, which form simple distichous spikes in *Ophioglossum*; and more or less branched panicles in *Botrychium*.

Though in many respects similar in their habit, there is one remarkable difference between *Ophioglossum* and *Botrychium* in respect to the manner of their development. In *Botrychium*, as we have already seen, the succeeding years' fronds are found within the base of the growing stems, but in *Ophioglossum* a lateral bud is developed by the side of the current year's fronds.

In the present family there is some variety of character among

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the exotic species, which gives rise to four sectional groups:— § *Euophioglossum*, in which the fertile branch is solitary, and the sterile ovate or linear-oblong, represented by our two indigenous species; § *Ophioderma*, in which the fertile branch is solitary, and the sterile ribbon-like dichotomously branched or more rarely undivided, represented by the *O. pendulum* of the Eastern Archipelago; § *Rhizoglossum*, in which the sterile and fertile fronds are distinct, represented by the *O. Bergianum* of South Africa; and § *Cheiroglossum*, in which several fertile spikes are developed from the margin of the hand-shaped sterile frond near its base, represented by the *O. palmatum* of the West Indies.

The genus is widely distributed, occurring in most parts of the globe. On account of the simple form of their fronds, the species present much similarity of aspect; but though comparatively few in number, they may be regarded as more numerous than appears to be admitted by some modern botanists. They are, however, as in other simple-fronded genera, really difficult to discriminate.

The name is derived from the Greek *ophis, ophios* a serpent, and *glossa* a tongue, and hence the vernacular name of Adder's Tongue.

SYNOPSIS OF THE SPECIES.

1. **O. vulgatum**: larger; barren branches of the fronds ovate-obtuse, or sometimes narrower and more elongated; fertile branch linear.
2. **O. lusitanicum**: minute; barren branches of the fronds linear or linear-lanceolate, fleshy; fertile branch linear oblong.

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THE COMMON ADDER'S TONGUE.

OPHIOGLOSSUM VULGATUM.

O. fronds usually solitary (4-12 in.); barren branch ovate obtuse, ecostate, thick herbaceous; fertile branch linear stalked, its stalk of equal width throughout. [Plate CXIII A.]

OPHIOGLOSSUM VULGATUM, *Linnæus, Sp. Plant.* 1518. *Bolton, Fil. Brit.* 2, t. 3. *Smith, Eng. Bot.* ii. t. 108; *Id., Eng. Fl.* 2 ed. iv. 318. *Mackay, Fl. Hib.* 346. *Hooker & Arnott, Brit. Fl.* 7 ed. 593. *Babington, Man. Brit. Bot.* 4 ed. 429. *Newman, Hist. Brit. Ferns,* 3 ed. 325. *Deakin, Florigr. Brit.* iv. 33, fig. 1576. *Moore, Handb. Brit. Ferns,* 3 ed. 275; *Id., Ferns of Gt. Brit. Nature Printed,* t. 51 B. *Sowerby, Ferns of Gt. Brit.* 81, t. 46. *Bentham, Handb. Brit. Fl.* 624. *Hooker, Fl. Lond.* iv. t. 75; *Id., Gen. Fil.* t. 59 B. *Gray, Nat. Arr. Brit. Pl.* ii. 20. *Lowe, Nat. Hist. Ferns,* vii. t. 65 A. *Swartz, Syn. Fil.* 169. *Schkuhr, Krypt. Gew.* 155, t. 153. *Willdenow, Sp. Plant.* v. 58. *Sprengel, Syst. Veg.* iv. 22. *Presl, Supp. Tent. Pterid.* 49. *Nyman, Syllog. Fl. Europ.* 435. *Fl. Danica,* t. 147. *Svensk Bot.* t. 378, fig. 1. *Sturm, Fl.* (Farrn.) t. 11. *Ledebour, Fl. Ross.* iv. 504. *Koch, Syn.* 2 ed. 973. *Gray, Bot. North. United States,* 2 ed. 602, t. 13. *Mettenius, Fil. Hort. Bot. Lips.* 121.

OPHIOGLOSSUM OVATUM, *Salisbury, Prod.* 401.

OPHIOGLOSSUM RIEHLII, *Hb. Imp. Pal. Vien.;* according to Presl.

OPHIOGLOSSUM UNIFOLIUM, *Gilibert, Exerc. Phytol.* ii. 554.

Var. **microstichum**: fronds much smaller (3-5 in.); barren branch ovate, fertile linear-oblong apiculate. [Plate CXIII B.]

OPHIOGLOSSUM MICROSTICHUM, *Acharius, Kong. Vet. Acad. Handl.* 1809, 59. *Svensk Bot.* t. 378, fig. 2.

OPHIOGLOSSUM VULGATUM, *v.* MINUS, *Moore, Ferns of Gt. Brit. Nature Printed.* under t. 51 B; *Id., Handb. Brit. Ferns,* 3 ed. 277.

OPHIOGLOSSUM GRAYI, *Beck, Bot. North. and Midd. St.* 458.

Caudex or *Corm-like Crown* forming a thickened fusiform descending axis (rhizome, *Presl*), terminated by a bud or growing point enclosed by a few brown membranaceous sheaths. *Roots* coarse, brittle, fleshy, spreading horizontally, unbranched, growing in a somewhat whorled manner from the crown and the perpendicular axis. Some of these become elongated under-ground in a stolon-

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like manner, and produce a new crown at a distance from the parent, in which manner the plants are multiplied. The rudimentary plant of the perennial crown instead of being as in the Moonwort enclosed within the stem, forms a new growing point by its side.

Vernation plicate or folded straight, the sterile branch enclosing the spike of fructification.

Stipes erect, smooth, cylindrical, hollow, succulent, usually elongated to about two-thirds the height of the frond, traversed by two or three vascular bundles, the base enclosed by membranaceous sheathing scales; divided above into a separate fertile and barren branch.

Fronds from three or four inches to a foot in height, thin but somewhat fleshy in texture. *Sterile branch* smooth, entire, sessile, broadly-ovate or ovate-elongate, acutish or obtuse, pale yellowish-green. *Fertile branch* erect, consisting of a simple spike terminating a more or less elongated footstalk, which appears to spring from the inner base of the sterile branch; *spike* linear, very slightly tapering upwards. It occasionally happens that fronds are met with developing from two to six fertile spikes, but it is very seldom that more than one frond is produced from each crown.

Venation of the barren branch consisting of a series of uniform *veins* (no *costa* or midvein) everywhere anastomosing, and forming a series of narrow elongated hexagonal areoles, those towards the circumference becoming shorter and broader; within these are a series of lesser veins (*venules*) dividing the areoles into other smaller ones of similar form; and from the sides of these again branch, more or less abundantly, short divaricate free included *veinlets*, which are usually more numerous near the margin.

Fructification occupying the margins of the linear spike, which terminates the contracted fertile branch. *Spore-cases* smooth, spherical, without ring or reticulations, embedded in a single series along the two opposite edges of the spike, bursting transversely, and then forming gaping concavities which give a toothed appearance to the margins. *Spores* verruculate, roundish, pale-coloured.

Duration. The crowns and roots are perennial. The fronds are annual, growing up in May, reaching maturity in June or July, and then gradually drying up and perishing.

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The Common Adder's Tongue, with its broad oval barren, and linear fertile branch, is so unlike other British Ferns, except the Dwarf Adder's Tongue of Guernsey, that it may be at once distinguished by these features. Its simple barren branch does not present much variation, the principal differences lying between a short broad ovate outline, and a more elongated form approaching to lanceolate. The Guernsey species has linear or linear-lanceolate fronds, and is altogether a pigmy compared with the common sort.

The Common Adder's Tongue is a generally dispersed British plant, and is mostly abundant where it occurs. The localities in which it is found are moist loamy pastures and meadow land, in which situations it often proves injurious to the grass crop, from its abundance, and from being disliked by cattle. It is however, observes Dr. Kinahan, capricious in its growth, being one year abundant, and the next not to be found. It seems less common in Wales, as well as in Scotland and Ireland, but extends northwards to Orkney and Shetland, in the former of which Islands Mr. J. T. Syme has found a small variety, fructifying in autumn. There are but few recorded Irish habitats, though it is found in the widely-separated counties of Antrim, Galway, Dublin, and Cork. Mr. Watson gives 600 feet as the probable limit of its altitude above the sea level. The records of its distribution are :—

Peninsula.—Cornwall. Devonshire: Slateford; Barnstaple, *J. Nash;* Okehampton, near Exeter, *R. J. Gray;* Westdown, near Ilfracombe, *Rev. F. Mules.* Somersetshire: near Bristol, *Miss Worsley;* Bath, *R. Withers.*

Channel.—Hampshire: Strathfieldsaye; Stoke; Wanston. Isle of Wight: Bembridge Down; Blackgang Chine; West Cowes, &c. Dorsetshire: Box. Wiltshire: meadows at Longleat, *Mr. Rowden.* Sussex: Highlands; Framfield, &c.

Thames.—Hertfordshire: Bury Woods, Hitchin; Elstree; Essenden, and other parts. Middlesex: Hackney Marshes; Sion-lane, Isleworth; Osterley Park, Brentford, *J. Bevis;* Acton, *S. O. Gray.* Kent: West Farleigh; Greenhithe; near Canterbury, &c. Surrey: Compton; Beddington, *D. Maher;* Cobham; Reigate; near Dorking, *J. Bevis,* &c. Oxfordshire: Banbury. Essex.

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Ouse.—Suffolk. Norfolk: Upton Broad; Ellingham Fen, &c. Cambridgeshire: Wilburton; Grantchester; Whitwell; Madingley, *Rev. W. A. Leighton.* Bedfordshire. Huntingdonshire.

Severn.—Warwickshire: Foleshill; Wellesbourne, &c. Gloucestershire. Herefordshire: Howle Hill, Ross; in a wood at West Hope Hill, *E. Newman;* Upton Bishop; Whitbourne, *Miss Atwood;* Berrington Park, *E. Newman;* &c. Staffordshire: Needwood. Shropshire: West Felton, *Rev. W. A. Leighton;* Bridgenorth, *W. A. L.;* Llandforda Park, near Oswestry, *Rev. T. Salwey.*

Trent.—Leicestershire: near Braunston, *Rev. A. Bloxam;* Thringston; Humberstone. Nottinghamshire: Paplewick; Colwick, *Dr. Howitt.* Derbyshire: Heanor, *Dr. Howitt;* Breadsall.

Mersey.—Cheshire: Field at Heawood Hall, Alderley, *H. C. Watson.* Lancashire: Warrington, *W. Wilson;* Gate Wharf, Sankey, *T. G. Rylands;* Bidston Marsh: Todmorden; Manchester, &c.

Humber.—Yorkshire: Round Howe, near Richmond, *J. Ward;* Settle; Whitby; Leeming-lane, *T. Simpson;* Sheffield; Huddersfield; Pottery Car, near Doncaster, *S. Appleby;* &c.

Tyne.—Durham: Middleton, *R. Bowman.* Northumberland: Hexham; Hawthorn Dene; Haltwhistle.

Lakes.—Westmoreland: Crosby Ravensworth, *R. Clarke.* Cumberland: St. Bee's Meadows, plentiful, *J. Robson.*

S. Wales.—Pembrokeshire: field near Roche Castle, *S. O. Gray.*

N. Wales.—Anglesea. Denbighshire: Wrexham, *J. E. Bowman.*

W. Lowlands.—Kirkcudbrightshire. Lanarkshire.

E. Lowlands.—Berwickshire: Coldstream. Edinburghshire: Dalmeny Wood, *W. Brand;* Arniston Woods, Edinburgh. Linlithgowshire.

E. Highlands.—Fifeshire: Dunfermline, *G. M'Nab.* Perthshire: Dunsinane. Forfarshire. Morayshire: Burghead, *G. Wilson.*

W. Highlands.—Argyleshire.

N. Isles.—Orkney: *Rev. C. Clouston;* at Swanbister Mr. Syme finds the var. *microstichum* fructifying in autumn. Shetland.

Ulster.—Antrim: Knockagh, Carrickfergus; Banks of the Logan, near Belfast, *W. Thompson.* Armagh, *J. R. Kinahan.*

Connaught.—Galway: Ballinasloe, *Countess of Clancarty;* Arran Isles, *J. Ball.*

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Leinster.—Dublin: Holly Park, Dublin, *S. Foot;* Dunsinsk; Dodder Valley, Kilnasantan, *J. R. Kinahan.* Wexford: Rathcormack, *T. Barry.* Meath, *G. A. Pollock.*

Munster.—Cork: Clonmel, "found several years since by *Mr. R. Davis.*" Tipperary: Annagh Inch, along Little Brosna and Pallas Rivers, *J. R. Kinahan.* Kerry: Beginnish Island, Lough Kay, Valentia, *J. R. K.*

This species is dispersed over nearly the whole of Europe, from the Scandinavian territories, and Russia, through Holland, Belgium, France, Switzerland, Germany, Spain, Italy, Dalmatia, Croatia, Hungary, and Transylvania, to Bosnia in European Turkey, and the Crimea (Tauria). In Asia, it occurs in the Caucasus, in the East Indies, in Siberia, in the Ural region, and in Kamtschatka and the island of Unalaschka. Brackenridge records Madeira. It is further met with in various parts of North America and in Mexico; and according to the Hookerian Herbarium in New Zealand. The *O. costatum* including *O. elongatum*, of New Zealand, New Holland, and the Cape of Good Hope, is but doubtfully distinct from this species, except as a variety, differing more in the presence of a central costa, than in aspect or external structure.

Though of similar habit to the *Botrychium*, this plant is more readily cultivated. For this purpose the plants should be taken up without having their roots broken, in sods of the soil in which they naturally grow, and should be planted in similar soil, in any moderately exposed situation, where the roots may be moist and cool, but not liable to excessive wetness. A soil of a loamy character and rather stiff is generally preferred. It is one of those plants which seem to derive benefit from the shade of surrounding herbage such as accompanies it in its native pastures, and in consequence 'gardenesque' neatness is inimical to it; but we cannot at all adopt the notion of Mr. Newman, that the Adder's Tongue is parasitical on the herbage with which it is associated.

According to Gerarde, "the leaves of Adder's Tongue stamped in a stone mortar, and boiled in oyle oliue vnto the consumption of

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the juice, and vntill the herbes be dry and parched, and then strained, will yeeld a most excellent greene oyle, or rather a balsame for greene wounds, comparable to oile of St. John's-wort, if it do not farre surpasse it." An ointment made of the fresh fronds of this fern, is still used in country places as a vulnerary, but the virtues of the plant are not now so highly esteemed as formerly. Lightfoot states that the common people of Scotland so used it in his day, and it appears from Mr. Newman's account, that the plant is still gathered for the same purpose in Herefordshire, and also in some parts of Surrey and Sussex, where it is used under the name of "Adder's-spear ointment." It is however disregarded by medical men of the present day.

There are some variations of form among the plants of Adder's Tongue found in different localities, some having the barren branch shortly ovate and blunt, and some narrower and more elongated, becoming ovately lance-shaped; both these are represented in our plate. Besides these variations, a somewhat marked variety has been observed:—

1. *microstichum* (M.). This is much smaller than the normal plant, three to five inches high, the barren branches of a narrow oval outline, the fertile linear-oblong apiculate. The plant reaches maturity in September, at which period the common form has decayed. The venation is the same as in the common form. The plant was found at Swanbister, Orkney, by Mr. J. T. Syme. It appears sufficiently like the *O. microstichum* of Acharius to be regarded as the same form, but is probably rather to be considered as a small variety of *O. vulgatum* than as a distinct species. The small size and narrow outline of forms like the present, have led some botanists to unite *O. vulgatum* with *O. lusitanicum*, such plants as those now referred to being taken as connecting links; but this combination of species so evidently distinguishable is surely carrying the so-called reduction of false species to an extreme length, and is at least as confusing as the opposite practice. [Plate CXIII B.]

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THE DWARF ADDER'S TONGUE.

OPHIOGLOSSUM LUSITANICUM.

O. fronds small, solitary, or two or three from each crown; barren branch linear or linear-lanceolate, fleshy; fertile branch linear-oblong apiculate, its stalk thickened upwards. [Plate CXIV.]

OPHIOGLOSSUM LUSITANICUM, *Linnæus, Sp. Plant.* 1518. *Moore, Pop. Hist. Brit. Ferns*, 2 ed. 195, t. 22, fig. 3; *Id., Ferns of Gt. Brit. Nature Printed*, t. 51 C; *Id., Handb. Brit. Ferns*, 3 ed. 278. *Newman, Hist. Brit. Ferns*, 3 ed. 331. *Sowerby, Ferns of Gt. Brit.* 82, t. 47. *Babington, Man. Brit. Bot.* 4 ed. 429. *Swartz, Syn. Fil.* 169. *Willdenow, Sp. Plant.* v. 59. *Sprengel, Syst. Veg.* iv. 22. *Presl, Supp. Tent. Pterid.* 50. *Hooker & Greville, Icon. Fil.* t. 80. *Lindley, Veg. King.* 2 ed. 77 (figure). *Nyman, Syllog. Fl. Europ.* 435. *Lowe, Nat. Hist. Ferns*, vii. t. 65 B.

OPHIOGLOSSUM VULGATUM, β. LUSITANICUM, *Hooker & Arnott, Brit. Fl.* 7 ed. 593. *Bentham, Handb. Brit. Fl.* 624.

OPHIOGLOSSUM ANGUSTIFOLIUM MINIMUM, *Barrelier, Icon.* t. 252, fig. 2.

Caudex or *Corm-like Crown* forming a thickened, oblong-fusiform blunt descending axis (rhizome, *Presl*), the terminal bud or growing point conical, and enclosed by a few brown membranaceous sheaths. *Roots* coarse, brittle, fleshy, spreading or descending, unbranched, growing irregularly from the axis; one or more of these becoming elongated, and producing a new growing point or crown.

Vernation plicate or folded straight.

Stipes erect, smooth, cylindrical, succulent, one-third to one-half the height of the frond, furnished with two or three slender vascular bundles, divided into a separate fertile and barren branch, the base enclosed by membranaceous sheathing scales, which are taper-pointed above, dilated below.

Fronds from one to three inches high, thick and fleshy or succulent in texture, of a pale-green colour. *Sterile radical fronds* (commonly but not always accompanying the branched fertile fronds) linear-lanceolate, smooth, tapering below into the stalk or stipes. *Sterile*

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branch of the fertile fronds linear, or more frequently linear-lanceolate, tapered below to its junction with the fertile branch, spreading, bluntish, from three-fourths of an inch to one and a half inch long, somewhat elevated at the margins. *Fertile branch* erect, taller than the barren, consisting of a spike, supported on a longish stalk which is thickened upwards and becomes broad fleshy and flattened at the base of the spike; *spike* linear-oblong, apiculate, about half an inch long, often rather widened a little above the base, fleshy, and bearing along each margin from three to six spore-cases. A barren radical frond frequently accompanies the fertile one.

Venation of the barren branch, consisting of a series of uniform *veins* (no *costa* or midvein) furcately branching, so as to produce a series of parallel venules, anastomosing to form a few long narrow areoles, which are apparently without free included *veinlets*.

Fructification occupying the margins of the spike. *Spore-cases* smooth, spherical, without ring or reticulations, embedded in a single series of from three to six in each margin of the spike, bursting transversely. *Spores* smooth, roundish or angular, pale-coloured.

Duration. The crown and roots appear to be perennial, though it has been suggested that they are biennial. The perennial character of the plant may perhaps be maintained by the successive production of crowns. The habits of the whole group *Ophioglossaceæ*, are, however, little known. The fronds grow up in autumn, and continue through the winter, perishing in spring.

This curious little plant, one of the most recent additions to the list of British species, may be known from the Common Adder's Tongue by its small size, its thick fleshy texture, and the narrow outline of the sterile branch of its frond. The plants average about a couple of inches in height, and rarely exceed three inches. It is an extremely interesting plant, and may fairly be allowed to remain separate from *O. vulgatum*.

This diminutive species was found in 1854 by Mr. G. Wolsey, in the neighbourhood of Petit Bot Bay, on the south coast of the Island of Guernsey, growing amidst short herbage on the summit of rocks, sloping towards the south. It has since been found abundantly

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in other localities in that island, whence both Mr. Wolsey and Mr. C. Jackson have furnished specimens. The plants are developed in autumn, and are fully fructified by October. It seems probable that a diligent search would be rewarded by its discovery in the western counties of England, or in Ireland. It must, however, be sought after in winter, or even earlier.

This Fern is found in the European countries bordering the Mediterranean, as well as in many of the islands of that sea: *e. g.*, Spain, Portugal, France, Italy, Sicily, Dalmatia, and Greece. It grows also at Tangiers, Algiers, and probably elsewhere on the African coast; and in the Atlantic Islands of Madeira, Teneriffe, the Canaries, the Azores and the Cape de Verds. It is found in the southern hemisphere at Swan River, and in New Zealand. Other plants closely allied to, and perhaps identical with this, have been found by Mr. Spruce at St. Gabriel, and by others in New Grenada, Java, and Borneo; and in the Hookerian Herbarium, are others again comparatively broader in the fronds, from Tasmania, the Isle of Pines, and St. Helena, all three being at least closely allied to *O. lusitanicum*. The *O. minimum* of New Zealand, is a diminutive form of this normally diminutive species.

The most successful attempts that have been made to cultivate this little plant have consisted in taking up the roots, in little clods of soil, and planting them in a compost of sandy loam, which resembles the earth in which they naturally grow. In this way, the plants may be occasionally preserved and induced to reappear at the proper season; but like all the allied species it can hardly be considered as a manageable subject in the cultivator's hands.

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ADDENDA.

[Since our former volume issued from the press, we have received many additional varieties, the most important of which are noticed in the following supplementary pages.]

Polypodium vulgare (vol. i. pp. 63–67).

1. *acutum* (M.). Buckinghamshire: Great Missenden, *R. Heward.*

4. *sinuatum* (M.). Devonshire: Instow, *C. Jackson.*

5.* *venosum* (M.). A small and subpermanent form, having the fronds minutely serrated, but chiefly remarkable for the venose appearance of its surface, the veins being surrounded by narrow lines of dark green tissue while the intervening spaces are yellowish. It was found in Yorkshire by Mr. A. Clapham.

7. *auritum* (Willd.). Devonshire: Eggesford, *C. Jackson.* Westmoreland: Windermere (serrated), *F. J. Jeffery.*

9. *cristatum* (M.). A form of this with a finely multifid apex has been found in Devonshire, at Fremington, by Mr. C. Jackson.

10. *serratum* (Willd.). Surrey: Compton, *T. M.*

11.* *canariense* (M.). See vol. i. p. 66. Somersetshire: Nettlecombe, *C. Elworthy.*

12.* *multifido-cristatum* (M.). This is one of the most beautiful forms yet known. The largest fronds we have seen are scarcely six inches high, and have the lower pinnæ or segments finely multifid-crisped as in the Crested Male Fern, but the apex is several times multifid forming a large spreading head, and the branches of the head are multifid-crisped forming little curly tufts of laciniate segments. It was found in 1855 by Mr. Henry Parker, on an old wall at Hutton, near Weston-super-Mare, Somersetshire.

13. *multiforme* (Clowes). Netley Abbey (truncate form), *G. B. Wollaston.*

13.* *attenuatum* (M.). A fine large lax-fronded form, sometimes as much as sixteen inches long exclusive of the stipes, and eight inches across. The segments are distant, dilated at the base on both sides, slightly aurite in front, the margins notched with distant shallow serratures, which sometimes become enlarged into lobes, when it resembles the less developed states of *semilacerum* (14); the chief peculiarity of the variety however is the attenuated apices of the distant segments, which become elongately caudate. It was found some years since in Guernsey by Dr. Allchin, and proves to be permanent.

14. *semilacerum* (Link). Dumfries-shire: Moffat, *J. Anderson.* Westmoreland: Whitbarrow, *F. Clowes.*

Polypodium alpestre (i. 81).

E. Highlands.—Perthshire: mountains between Glen Lochy and Glen Dochart; Craig Challiach.

N. Highlands.—Sutherlandshire: Ben More, *T. Westcombe.*

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Polystichum Lonchitis (i. 119).

According to Mr. Westcombe, the habitats of this Fern are confined to rocks of micaceous formation.

Mr. C. Jackson has sent a small frond in which the margins are crenately-serrate, and not at all spiny-toothed.

Polystichum aculeatum (i. 129–133).

Humber.—Yorkshire: Scarborough, *A. Clapham.*
Tyne.—Durham: Darlington, *Mrs. Crawford Marley.*
W. Lowlands.—Dumfries-shire: Moffat, *J. Anderson.*
E. Highlands.—Inverness-shire: Dunphail, *Miss. F. Brown.*

1. *lobatum* (Deak.). Dumfries-shire: Moffat, *J. Anderson.* Inverness-shire: Dunphail, *Miss F. Brown.*

1.* *lobatum acutum* (Jerv.). A narrow attenuate form with the apex narrowed out to a long point, the pinnæ acute or almost acuminate, and the segments small close and remarkably spiny-toothed. Found in Staffordshire by Mr. S. Jervis, and in Somersetshire by Mr. Elworthy.

5. *multifidum* (Woll.). Mr. Elworthy has found in Somersetshire a finely tufted constant form of this variety.

Polystichum angulare (i. 140–159).

E. Highlands.—Perthshire: Ochtertyre, *Dr. P. Maclagan.*
Munster.—Waterford: Clonmel, *J. Sibbald.*

2. *hastulatum* (M.). Devonshire: Marwood, *Rev. F. Mules.* Sussex: *J. H. Sclater.* Durham: Darlington, *Mrs. Crawford Marley.* A small form of this variety has been found by Mr. Elworthy, near Nettlecombe.

3. *quadratum* (M.). Devonshire: Marwood, *Rev. F. Mules.* Sussex: near Uckfield, *J. H. Sclater.*

5. *acutum dissectum* (M.). Devonshire: Marwood, *Rev. F. Mules.* Surrey: Leith Hill, *H. Lavey.*

6. *aristatum* (Woll.). Devonshire: Marwood, *Rev. F. Mules.*

9. *densum* (M.). Devonshire: Barnstaple, *C. Jackson.* Somersetshire: Nettlecombe, *C. Elworthy;* Weston-super-Mare, *H. Parker.*

11. *rotundatum* (M.). This as it becomes more developed, has the pinnules somewhat roundish-trapeziform, and indistinctly three- or four- lobed. It is a very remarkable form.

15. *biserratum* (M.). Devonshire: Bideford, *C. Jackson.* Cork: Glendine near Youghal, *A. Tait.*

15* *biserratum incompletum* (M.). A large form of *biserratum* somewhat depauperated in respect to the pinnules, which are here and there in an irregular way slightly reduced in size, and variously misshapen. Found in Somersetshire at Nettlecombe by Mr. Elworthy.

16* *curtum* (M.). The fronds of this curious form are short and triangular, six or eight inches long and about five inches across the base. The pinnæ are rather irregular, crowded; the pinnules when least developed resemble those of *biserratum* (15), but are in some parts more or less pinnatifid approaching to *plumosum* (31). In all the fronds we have seen, the basal pair of pinnæ have

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their posterior pinnules enlarged, and quite pinnate at the base, deeply pinnatifid upwards; hence acquiring something of the outline and character of *Lastrea dilatata*. It was found near Nettlecombe, Somersetshire, by Mr. Elworthy.

16.** *pyramidale* (M.). A distinct-looking form, with the base of the frond broadest, giving it a pyramidal or elongately-triangular outline. The fronds are upwards of a foot long, exclusive of the stipes. The pinnæ are dense, the basal ones five inches long, the next pair about an inch shorter. The pinnules are evidently stalked, oblique, the basal ones deeply pinnatifid, with ovate toothed lobes; the upper part of the pinnules is biserrate, and the teeth acute, but not prominently aristate. It has been recently found by Mr. Elworthy at Nettlecombe, Somersetshire.

18. *trapezoideum* (M.). Devonshire: Barnstaple (larger, lax, with blunt pinnules) *H. F. Dempster;* Ottery St. Mary, *G. B. Wollaston.* Antrim, *A. Stansfield.*

18.* *reflexum* (Woll.). This somewhat resembles small states of *trapezoideum* (18) and *intermedium* (17) but the upper surface of the pinnules is convex, from the edges being constantly reflexed. It was found at Ottery St. Mary, Devonshire, by Mr. Wollaston.

18.** *elegans* (Woll.). A dwarf and elegant form, most remarkable in the more advanced fronds we have seen for the distinct acuminate teeth. The basal anterior pinnules are much the largest, and almost pinnate. It has fronds, however, which produce somewhat wedge-shaped pinnules, and the lobes of these are separated by acute open sinuses producing a biserrated appearance, which along with the large prominent spiny teeth give it a distinct aspect. It was found by Mr. Wollaston, near Worthing, Sussex.

18.*** *calcaratum* (M.). A dwarf interrupted form, in which the small pinnules where perfectly formed are remarkable for their long coarse conspicuous spiny serratures. In the upper part, the pinnæ become irregularly abbreviated, and the pinnules irregularly depauperated, the main rachis being also arrested and developed in the form of a small horn or spur amongst the misshapen pinnæ. It was found in Devonshire, by Mr. Wollaston.

21. *grandidens* (M.). The fronds of this variety, one form of which is sometimes known as *Baileyanum*, have the pinnules sometimes variously inciso-laciniate, or with a few large angular teeth. The rachis is occasionally developed into a horn or hook, and it has thence sometimes been called *cornutum*. Very elegant narrow-fronded forms have been found in Yorkshire near Whitby, by Mr. W. Willison, and in Somersetshire, near Weston-super-Mare, by Mr. H. Parker.

26. *præmorsum* (Allch.). Mr. Elworthy has recently found near Nettlecombe, two forms closely allied to this variety.

26.* *præmorso-pulchrum* (M.). This is intermediate in character between *præmorsum* (26) and *pulchrum* (19). It has small fronds and small pinnules which latter in the lower part of the frond are inciso-lobate with serrated lobes, whilst in the upper part they are more or less decurrent and misshapen, forming irregular more or less confluent pinnæ. It was found at Nettlecombe by Mr. Elworthy.

26.** *pumilum* (M.). This is smaller than the foregoing, but somewhat resembles *præmorsum* (26), the pinnules being more or less confluent but more regular than in that variety, and standing back so as to appear almost recurved. In

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some fronds the upper pinnæ are partially depauperated. It was found near Nettlecombe by Mr. Elworthy.

27.* *acuminatum* (M.). An elegant dwarf form, with attenuately pointed fronds and pinnæ, and small narrow acute pinnules which are very finely serrated. It was found by Mr. Elworthy near Nettlecombe.

28.* *arctatum* (M.). A fine large form resembling *lineare* (28), but less abnormal in its development, the pinnules being tolerably uniform, very rarely depauperated, and the apices of the pinnæ not being confluent into a long linear lobe but diminishing in the usual manner. The pinnules are narrow, almost linear, acute, with a very large acute anterior auricle; while towards the base of the frond they are a little more oblong, but even then narrow. It was found at Barnstaple by Mr. C. Jackson.

30. *dubium* (Woll.). Lancashire: Preston, *A. Stansfield.* Yorkshire: Whitby, *W. Willison.* Devonshire: Barnstaple, *C. Jackson.*

31.* *plumoso-gracile* (M.). A very elegant variety of thin papery texture, intermediate between *plumosum* (31) and *gracile* (27), having some of its pinnules oblong more or less lobed and incisely toothed, and some of them, here and there, narrower and having deeper and more evidently linear sharp-pointed teeth. It was found near Nettlecombe by Mr. Elworthy.

35.* *oxyphyllum* (M.). A fine and elegant form having the light and plumy character of *plumosum* (31), and the narrowish acute form of pinnule belonging to *acutum* (5), while the pinnules themselves are deeply pinnatifid in the distantly-lobed attenuate manner which is seen in *proliferum* (36), to which on the whole it has most affinity. It was found near Nettlecombe by Mr. Elworthy.

36.* *proliferum Wollastoni* (M.). See vol i. p. 156.

36.** *proliferum Footii* (M.). A remarkably fine form, closely allied to *proliferum* but differing in the more crowded segments and less attenuated apex of the pinnules, which together give a more dense appearance to the fronds. It is a large form, with broad fronds, and abundantly proliferous on the main rachis. The plant was found in the county of Clare by Mr. F. J. Foot, and has been sent to us by Dr. Kinahan.

41.* *Claphamii* (M.). A remarkably handsome form, which appears to have a permanent character. The fronds are large and somewhat lax, with distant pinnæ and pinnules, the latter having in a general way the character of a deeply-lobed *acutum* (5); that is they are somewhat broadly wedge-shaped and stipitate at the base, narrowish above, acute, with a large acute auricle, and smaller acute lobes. In this form, however, both the main and secondary rachides are multifid; the former being forked some inches from the top, the branches forking again two or three times producing a flat tufted head of acuminate divisions, which are throughout clothed with pinnules like the other parts of the frond; and the latter becoming forked once or twice at about an inch from the end. It is a charming variety, and was found near Whitby in Yorkshire by Mr. Thompson of Darlington, under the direction of Mr. Clapham, to whom and to Mr. C. Monkman we are indebted for specimens. Some of the plants found in the same locality are only multifid at the apex of the frond. The acute form of *multifidum* from Upcott, (vol. i., p. 158), appears to belong to this variety.

Lastrea Thelypteris (i. 168).

Severn.—Staffordshire: two miles north of Madeley, *G. Maw.*

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Lastrea montana (i. 172–176).

Peninsula.—Devonshire: Mudworthy and Marwood, *Rev. F. Mules.*
E. Highlands.—Inverness-shire: Dunphail, *Miss F. Brown.*

6. *furcans* (M.). A handsome and distinct form, which has proved quite constant. The fronds we have seen are about a foot high; they are apparently but slightly dilated at the apex, but the apices of the pinnæ are uniformly divided into a flattish tuft of spreading segments, producing an elegant crested appearance. It was found in Westmoreland by Mr. Stansfield of Todmorden.

Lastrea Filix-mas (i. 188–202).

1. *erosa* (Clowes). A small form apparently referrible to this, has been sent by Mr. Willison of Whitby, under the name of *thuioides*.

4. *incisa* (M.) subvar. *deorso-lobata.* Devonshire: Marwood, *Rev. F. Mules.* Surrey: near Guildford, *T. M.* Inverness-shire: Dunphail, *Miss F. Brown.*

4.* *incisa recurva* (M.). This sub-variety has the primary and secondary divisions of the fronds recurved, which gives it a distinct appearance. The upper fertile part of the frond is otherwise very like *deorso-lobata*; the lower sterile parts oblong and toothed as in *incisa*. It was found near Doncaster in 1857 by Mr. S. Appleby.

4.** *flexuosa* (M.). This is allied to *deorso-lobata* in its general character, but the main rachis is strongly and curiously twisted in a zig-zag way as in the zigzag variety of Lady Fern; the secondary rachides are also curved in a tortuous manner. It was found near Doncaster by Mr. S. Appleby.

4.*** *biserrata* (M.). A subform of the *incisa* type, with large oblong bluntish adnate semi-decurrent pinnules which are crenately lobed, the shallow rounded lobes or crenatures being serrated; this produces a distinctly biserrate margin; the upper basal pinnules are deorsely-lobate. It was found at Rossington near Doncaster, by Mr. S. Appleby.

6. *elongata* (M.). A fine form of this variety in which the pinnules are pointed forwards, and consequently somewhat decurrent at the base, has been sent under the name of *elegans* by Mr. W. Willison. It was found near Whitby in Yorkshire.

6.* *Willisonii* (M.). This was found by Mr. Willison in company with *elongata*, of which it is an elegantly depauperated subvariety. The fronds are large and the pinnæ distant; the pinnules are also distant but irregularly so, the intervals being sometimes as much as half an inch wide; they are directed forwards and strongly decurrent behind, of unequal size and irregularly toothed, sometimes laciniately depauperated. It is an interesting wild sport.

9. *paleacea* (M.). Devonshire: Marwood, *Rev. F. Mules.* Monmouthshire: Cwm-Glyn, near Pont-y-Pool, *T. H. Thomas.* Dumfries-shire: Moffat, *J. Anderson.* Inverness-shire: Dunphail, *Miss F. Brown.*

11.* *paleaceo-erosa* (M.). A small pinnuled form of the *paleacea* type, in which the pinnules are irregular in size, and erose at the margins. It was found at Cwm-Glyn, near Pont-y-Pool, by Mr. Thomas.

12. *abbreviata* (Bab.). Forfarshire: White Water Clova, *T. Westcombe.* This variety and *paleacea* are of subevergreen habit.

23.* *ramosa* (M.). A dwarf branched form of irregular outline. In the frond before us, two or three unequal bipinnate branches are produced at the base, and the

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apex is ramosely multifid; the pinnules are small oblong, blunt, and toothed. It was found in the Clova mountains, and was sent to us by Messrs. Stansfield, who state that all the fronds are more or less proliferous.

Another ramose form, too young as yet to be described, a seedling raised by Mr. J. Crossfield of Arnside, seems likely to be permanent.

Lastrea remota.

This species which has recently been determined as a native of England, should be inserted after *L. Filix-mas* (vol. i. p. 203),

THE REMOTE BUCKLER FERN.

LASTREA REMOTA.

L. fronds oblong-lanceolate, subtripinnate, glabrous; pinnæ acuminate, distant below; pinnules distinct, pyramidal or ovate-oblong, acute, shortly petiolate below, sessile with a narrow attachment, more or less adnate upwards, the basal ones pinnatifid almost to the costa; lobes oblong blunt serrated, the serratures acute mucronulate; sori copious over the whole frond, biserial near the costa; indusium reniform, persistent, obscurely eroso-dentate, without glands; caudex stout ascending; stipes and rachis stout scaly.

LASTREA REMOTA, *Moore, Ind. Fil.* 102; *Id., Journ. Proc. Lin. Soc.* iv. 193.
ASPIDIUM REMOTUM, *A. Braun, Verjung.* 330. *Kunze, Lin.* xxiii. 230. *Fée, Gen. Fil.* 291. *Mettenius, Fil. Hort. Bot. Lips.* 93; *Id., Aspid.* 57.
POLYSTICHUM REMOTUM, *Koch, Syn.* 2 ed. 979.
ASPIDIUM RIGIDUM, *β.* REMOTUM, *A. Braun, Döll. Rhein. Fl.* 16.

Caudex stout ascending, with a thick scaly crown.

Vernation circinate.

Stipes a foot long, stout, clothed with numerous scales of various size, some ovate acuminate three-quarters of an inch long, others smaller lanceolate or linear terminating in a lengthened hair-like point, the margin slightly wavy or toothed; along with these larger scales occur numerous others, which are minute ovate caudate and peltately attached. *Rachis* both primary and secondary, furnished with scales which become smaller upwards.

Fronds 3–4 feet high, erect, narrow oblong-lanceolate subtripinnate, smooth. *Lower pinnæ* 3–4 inches long ovate-acuminate, central ones 6 inches long, linear-oblong acuminate, all ascending, opposite or subopposite and distant below. *Pinnules* (basal ones of second pair of pinnæ) 1¼ inch long, shortly petiolate, pyramidal or pyramidal ovate, acute, pinnatifidly divided nearly to the costa, almost pinnate; lobes oblong, about ⅛ of an inch long, obtuse, the lowest ones sublobate at their base, otherwise serrated, the serratures most numerous and prominent at the apex, acute, mucronulate. The pinnules become gradually less pyramidal or ovate, and more oblong, at length linear oblong, as they recede from the main rachis; below, except in the case of the lowest, they are also sessile, with a narrowed attachment, but become gradually more and more adnate upwards. The pinnules of the upper pinnæ resemble the smaller pinnules of the lower ones.

Venation in the larger lobes consisting of a flexuous primary vein or *costa*, from which alternate *veins* proceed towards the serratures, sometimes becoming branched, the sori being situated medially on the simple, and close above the fork on the branched ones.

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In the smaller pinnules the costa bears a sorus medially on its lowest anterior vein, so that a row of sori are formed on each side of and near to the principal rib. The basal lobes often bear in addition two or three other sori, and are traversed by a series of alternate simple veins.

Fructification occupying the whole back of the frond from the base to the apex. *Sori* prominent distinct, biserial near the costa of the smaller pinnules, and biserial on the lobes in the larger ones. *Indusium* persistent, reniform, obscurely erose-dentate on the margin, not glandular. *Spore-cases* roundish obovate. *Spores* oblong, granulated.

This recent addition to our Fern Flora very much resembles in general character and aspect those vigorous examples of *L. cristata* v. *spinulosa* which are sometimes met with, having the same kind of narrow elongate erect fronds; but in its structural characteristics it differs materially from that plant, and agrees much more closely with *L. Filix-mas*. From *L. Filix-mas* itself, the incised pyramidal-pinnuled forms of which most nearly resemble it, it may be separated by the circumstance that its fronds are once more divided, being tripinnate. It appears to have reasonable claim to specific rank, although Professor Braun by whom it was first described, is now inclined to regard it as a more divided form of the Common Male Fern.

We have seen native specimens of this Fern from the neighbourhood of Windermere, where it was found by Mr. F. Clowes and Mr. I. Hudhart. It had previously been recorded only as a native of Southern Germany.

Lastrea spinulosa (i. 210).

Under the synonym *Aspidium spinulosum*, add :—*Smith, Eng. Fl.* 2 ed. iv. 279.

Lastrea dilatata (i. 229–246).

Peninsula.—Devonshire : Muddiford, *C. Jackson;* Websdale, *C. J.;* Bittadon, *Rev. F. Mules.*

Tyne.—Durham : Darlington, *Mrs. Crawford Marley.*

W. Lowlands.—Dumfries-shire : Moffat (various forms), *J. Anderson.*

E. Highlands.—Inverness-shire : Dunphail, *Miss F. Brown.*

3. *collina* (M.). Dumfries-shire : Moffat, *J. Anderson.* Perthshire : Ben Ledi, *Mrs. Hume Macleod.*

11. *micromera* (M.). Devonshire : Challacombe, *Rev. F. Mules;* Marwood, *F. M.* Somersetshire: Nettlecombe, *C. Elworthy.* Dumfries-shire: Moffat, *J. Anderson.*

12.* *grandidens* (M.). A neat but vigorous form, having somewhat distant pinnæ and pinnules, but remarkable for the evenly ovate-oblong outline of the pinnules, of which the sides curve inwards at the top to form a scarcely acute apex. It is further remarkable for the blunt oblong segments into which the pinnules are divided quite down to the costa, and for having the few teeth broad spreading and remarkably evident, as in *collina* (3). It has been gathered in Kent by the Rev. J. Dix, and by Mr. Jackson at Barnstaple, the Devon plant mentioned under *deltoidea* (i. 240) being referrible here.

15. *valida* (M.). Inverness-shire; Dunphail, *Miss F. Brown.*

20.* *ramosa nana* (M.). A most remarkable dwarf form, only a few inches high, the fronds consisting of uneven branch-like pinnæ, as in *Athyrium Filix-fœmina crispum*, and these furnished with interruptedly irregular pinnules of varied size and form. It has been sent by Messrs. Stansfield.

23*. *crispa* (M.). A dark-coloured thick-textured form, somewhat resembling *validum* (15) but having the pinnules very much curled or crisped. It was found by Mr. Elworthy in the neighbourhood of Nettlecombe.

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Lastrea æmula (i. 252).

Lakes.—Cumberland : near Sandwith, *Rev. G. Pinder.*
Munster.—Waterford : Clonmel, *J. Sibbald.*

Athyrium Filix-fœmina (ii. 28–35).

10. *excurrens* (M.). Devonshire : Moreton Hampstead, *Rev. J. M. Chanter.*

12. *odontomanes* (M.). Inverness-shire : Dunphail, *Miss F. Brown.* Kincardineshire : Cove, *A. Tait.*

18. *incisum* (Newm.). Polypodium of *Hoffmann.*

21. *laxum* (M.). Athyrium of *Schumacher.*

25. *rhæticum* (M.). Polypodium of *Linnæus.*

40. *interruptum* (Woll.). A very pretty form of this has been found by Mr. Elworthy at Nettlecombe, Somersetshire.

Asplenium lanceolatum (ii. 70).

Peninsula.—Devonshire : Morthoe, *Rev. J. M. Chanter;* Countesbury; wall near Holme bridge; lane near Splitchwick, going to Blacket Tor, *Miss Kitson.*

Asplenium Adiantum-nigrum (ii. 84–89).

Mr. J. McNab has recorded, that he has raised the typical form of this species from spores taken from the var. *acutum.*

12. *microdon* (M.). Devonshire : Hartland, *Rev. J. M. Chanter.*

Asplenium marinum (ii. 94).

E. Lowlands.—Berwickshire : Milnegraden eight miles from the sea, *Mr. Ainslie.*
W. Highlands.—Holy Island, *Dr. Balfour.*

Scolopendrium vulgare (ii. 154–183).

21. *polyschides* (Gray). Phyllitis of *Ray.*

29. *obtusidentatum* (M.). Folio ed. t. XLII. fig. 5.

32. *irregulare* (M.). Folio ed. t. XLII. fig. 8.

91. *crispum* (Gray). Folio ed. t. XLII. fig. 4. S. officinarum crispum of *Willdenow.*

107. *variabile* (Woll.). Folio ed. t. XLII. fig. 6, 7.

146. *laceratum dissectum* (M.). This form has become marginate, or almost bimarginate in some of the narrowed portions.

148.* *Elworthii* (M.). A very curious dwarf ramose flabellate seedling raised by Mr. Elworthy, mentioned at p. 194 under *lacerato-ramosum* (148). Fronds of the present year's growth now before us, are two inches long from the top of the stipes and three inches wide, and consist of three branches, one of which is three-parted, the branches being of a flabellate form, deeply incised, with wavy overlying lobes, and slightly marginate. It forms a dense mass of lobate toothed fan-shaped wavy divisions, in about four overlapping laminæ, the general outline being transversely oblong-reniform.

151. *ramosum* (Gray). S. officinarum ramosum of *Willdenow.*

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GLOSSARY OF TECHNICAL WORDS.

acrogenous: growing apically, or by accretion at the point or apex.
acuminate: pointed or acute with a narrowed prolongation.
adnate: attached by the whole width of the base.
aërial: developed in the air; applied to roots produced above-ground.
amorphous: shapeless, of no definite form; applied to the sori.
annulus: the ring which girts the spore-cases of ferns.
antheridium: a globular cell containing spermatozoids, produced on the germ-fronds of ferns.
archegonia: same as *pistillidia.*
areoles: the spaces enclosed between the veins when reticulated.
aristate: awned, furnished with long awn-like hairs.
articulated: furnished with a natural joint.
articulation: a natural joint or joining, where the parts when matured separate spontaneously.
asplenioid: having a resemblance to Asplenium, in certain peculiarities.
athyrioid: having a resemblance to Athyrium.
auricles: ear-like projections; applied to projections from the edges of the parts of the frond.
axis: the centre around which development takes place.

basal: situated at the base; applied when the receptacle is at or near the lower end of the veins.
bifid: two-cleft; split moderately at the end into two divisions.
bipinnate: twice pinnate; that is, the pinnæ again pinnate.
bipinnatifid: twice pinnatifid; that is, the segments again pinnatifid.
biserial: in two rows.
biserrate: doubly serrate; that is, the serratures themselves serrated.
blechnoid: having some resemblance to Blechnum.

cæspitose: growing in a tufted manner.
calyciform: calyx-like or cup-shaped.
capillary: hair-like.
capitate: having a small round knob like a pin-head.
capsules: same as *spore-cases.*
caudate: tailed or tail-like.
caudex: a form of stem in which the fronds grow from the apex or growing point.
caudiciform: having a tree-like stem.
ceraceous: of a waxy consistence.
chartaceous: of a papery or parchment-like texture.
circinate: folded up in a series of convoluted curves.
clavate: club-shaped, thickened upwards.
combined: united by a continuous longitudinal vein; applied to a peculiar form of venation.
confluent: flowing or running together, applied to sori when they spread out so as to join those nearest to them.
connate: blended together at the base; applied to opposite parts which grow together at the base.
connivent: coalescing at an acute angle; applied to veins thus united.
continuous: not jointed; the opposite of *articulated.*
cornute: horned, having a horn-like projection.
corrugate: having a wrinkled or crumpled wavy surface.
corymbiform: branched like a corymb, the branches of unequal length so as to become level-topped, or nearly so.
costa: the midrib of a frond, segment, pinna, pinnule, &c.
costæform: costa-like; applied when one of the lesser veins becomes central to the part in which it occurs, so as to resemble a midrib.
costal: of, or belonging to the costa.
creeping: prostrate and much extended; applied to stems which are considerably elongated in a horizontal direction.
crenate: notched with shallow rounded or convex teeth.

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crenulate: finely crenate; that is, divided into little crenels or convex teeth.
crinite: hair-scaly; having long weak hair-like scales.
cristate: crested; bearing a tuft or crest of curly segments.
cucullate: hooded, or hollowed out to resemble a hood.
cuneate: wedge-shaped, inversely narrow-triangular, or narrowed downwards from a broad base.

davallioid: having a resemblance to Davallia.
decompound: consisting of many parts; applied to quadripinnate and other very much divided fronds.
decumbent: spreading, reclining, or having a horizontal direction, with a tendency to ascend at the point.
decurrent: prolonged down the axis below the part where attached.
deflexed: bent downwards.
deltoid: triangular in outline, like the Greek *delta*.
dentate: notched in a scolloped manner forming acute teeth, with concave interspaces.
denticulate: having fine or small teeth.
depauperated: impoverished; applied to an imperfect or contracted development.
dichotomous: a two-forked mode of ramification.
dimidiate: halved or one-sided; applied when one half of the organ seems to be suppressed, or very much reduced.
dimorphous: of two forms; usually applied to ferns in which the sterile and fertile fronds have a distinct character.
diplazioid: having a resemblance to Diplazium.
distichous: two-ranked; arranged in two opposite rows.
divaricate: spread out at a wide angle.
dorsal: growing from the back; applied to ferns in which the sori are borne on the back of the frond.
dorsiferous: bearing sori behind, or on the under surface.

ebeneous: smooth, black, ebony-like.
echinate: spiny, like a hedgehog.
endogenous: growing internally, or by accretion from within.
epidermal: of, or belonging to the epidermis or skin.
epiphytal: growing on other plants.
erose: irregularly notched at the margin, as if nibbled or bitten.
exannulate: ringless; applied to those ferns in which the spore-cases have no ring.
excurrent: running out or projected outwards.
exogenous: growing externally, or by accretion from without.
extrorse-marginal: turned or directed outwards from the margin.

falcate: sickle-shaped.
farinose: having a mealy surface.
fascicle: a bundle or collection of any organs, growing from a common point.
ferruginous: rusty or rust-coloured.
fimbriate: fringed at the margin with longish narrow fringe-like processes.
flabellate: fan-shaped, spread out flat like a fan.
flexuous: wavy or zig-zag in direction.
fornicate: arched or vaulted over.
free: distinct; applied to veins that are not united at their apices.
frond: the whole of the leaf-like development from the stem, including stipes (stalk) and lamina (leafy part).
fugacious: perishing rapidly.
fusiform: spindle-shaped; tapering to each end.

glandular: bearing glands.
glomerate: collected into a close head or heads.
grammitoid: resembling the genus Grammitis.
granulate: having a rough surface as if strewed with little granules.
gymnogrammoid: resembling the genus Gymnogramma.
gyrate: same as *circinate*.

hamate: hooked or curved at the end.
hastate: halberd-shaped; furnished at the base with two divergent lobes.
hemitelioid: having a resemblance to Hemitelia.
hippocrepiform: shaped like a horse-shoe.

imbricate: overlapping like the tiles of a roof.
immersed: sunk in a depression of the surface.
impari-pinnate: pinnate, but having an odd or single leaflet at the end.
indusiate: furnished with an indusium.
indusiform: indusium-like; usually applied to the attenuated margin of the frond, when it becomes membranaceous and recurved.
indusium: the membrane which in some ferns lies over or covers the sorus while young.
intramarginal: placed within the margin.
involucrate: having an involucre.
involucre: an investing membrane lying beneath instead of over the spore-cases.

keeled: having a prominent ridge, like the keel of a boat.

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laciniated: slashed or cut into irregular narrow taper-pointed lobes or segments.
lamina: the leafy portion or blade of the frond.
lanate: having a woolly surface.
lenticular: having a form like that of a double convex lens.
lobate: notched into deep divisions or lobes.
lobules: little lobes; usually applied to the secondary divisions of a doubly pinnatifid frond.

marattiaceous: belonging to, and represented by the family *Marattia*.
marchantiform: Marchantia-like, that is, scale-like, lying flat on the surface of the ground.
marginate: applied among ferns to the production of an excurrent membrane on the surface of the frond, which generally forms a kind of double margin.
medial: in the middle; applied when the receptacle is situated between the base and apex of the vein.
multifid: many-cleft; cut into many segments.
multifid-crisped: cut into many segments, which are spread out, and curly.
mucronate: having a short hardened point.
muricate: roughish with small raised points.
muriculate: finely muricate; covered with smaller raised points.

naked: coverless; applied to those ferns where the sorus is without indusium or involucre.
node: the point on a stem at which a leaf or frond is developed.

obovate: inversely egg-shaped.
oligocarpous: consisting of few spore-cases; the opposite of *polycarpous*; applied when the sorus is composed of a comparatively small number of capsules.
ophioglossaceous: belonging to, and represented by the family or genus *Ophioglossum*.
ovoid: approaching to oval or egg-shaped.

palmate: spread out flat in a hand-shaped form.
paniculate: compoundly branched so as to resemble a panicle.
papillose: bearing papillæ or little teat-like projections from the surface.
parenchym: the sphæroidal cellular tissue of plants.
patent: spreading at an angle of about 45°.
pectinate: comb-shaped; split into narrow close even segments.
pedate: palmate, with the two outer or lateral lobes divided towards their base.
pedicellate: stalked; same as *petiolate*.
peltate: shield-like; roundish with a central attachment.
persistent: enduring; the opposite of *fugacious*.
petiolate: furnished with little stalks or petioles; when they are very short, the diminutive term *petiolulate* is sometimes used.
pilose: hairy.
pinnæ: the divisions of a pinnate frond.
pinnate: completely once divided, the parts being distinctly separated.
pinnate-pinnatifid: once pinnate, and then pinnatifid.
pinnatifid: partially once divided, the parts being connected at the base.
pinnules: little pinnæ; the divisions of a pinna when quite distinct; when there is more than one series, the first are *primary* pinnules, the next *secondary*, and so on.
pinnulets: little pinnules; the same as secondary pinnules.
pistillidia: the mother-cells produced on the germ-frond of ferns which give rise to the embryo and axis of growth.
pleurenchym: the elongated or woody tissue of plants.
plicate: folded up straight.
polycarpous: consisting of many spore-cases; applied when the sori are large, and the spore-cases very numerous.
polypodiaceous: belonging to, and represented by the family or genus *Polypodium*.
polypodioid: having some resemblance to Polypodium.
prosenchym: a peculiar form of cellular tissue, in which the cells have acute extremities.
prothallus: the germ-frond of a fern.
pruinose: covered with a fine secretion forming a bloom similar to that seen on many fruits.
pulverulous: powdery, covered with meal-like dust.
punctiform: dot-like, forming distinct round or roundish heaps; applied to the sori.

quadrate: square, four-sided.
quadripinnate: four times pinnate.
quadripinnatifid: four times pinnatifid.

rachis: the main ribs of the fronds, connecting the separate parts.
rachiform: reduced to the form of a rib or rachis.
receptacle: that point of the frond to which the sorus is affixed.

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repand: slightly sinuated, so as to form a gently waving marginal line.
resupinate: in an inversed position, upside down.
reticulated: united so as to form a regular network.
retuse: blunt-ended with an indentation or shallow terminal notch or depression.
rhizome: a form of stem in which the fronds are developed laterally and not from the growing point.
rhizomatous: having a rhizome.
rhomboidal: oval, somewhat angular in the middle.
ring: an elastic belt, surrounding the spore-cases; same as *annulus*.

sagittate: furnished with a pair of basal acute lobes, like the head of an arrow.
scalariform: a kind of tubular vascular tissue found in ferns.
scandent: climbing; applied to elongated stems, which climb like ivy.
scolopendrioid: resembling Scolopendrium.
secund: having the parts all directed to one side.
segments: the divisions of a pinnatifid frond.
serrate: notched with sharp straight teeth pointing forwards.
sessile: sitting close; not stalked.
seta: a bristle-like hair.
setaceous: bristly or bristle-formed.
simple: applied to undivided parts, as fronds, &c.
sinuate: lobed as in the leaves of the oak, the margin forming a strongly sinuous or wavy line.
sinus: the bay or recess between two projecting parts of the margin.
sori: the collections (little heaps or lines) of spore-cases found on the back of the frond (sing. *sorus*).
soriferous: bearing sori, fertile.
spermatozoid: a free spiral filament contained in certain sperm-cells of the antheridia or male organs of ferns.
spike: a narrow form of fructification in which the spore-cases are sessile.
spikelets: little spikes; applied to the branches of the fructification of some osmundaceous and ophioglossaceous ferns.
spore: the minute seed-like germ-buds produced by ferns and other cryptogamous plants.
spore-cases: the small one-celled vessels which contain the minute spores.
sporangia: same as *spore-cases*.
sporangiferous: bearing the spore-cases or sporangia.
stipes: the stalk-portion of a frond or fronds (pl. *stipites*).
stipitate: stalked.
stoma: a mouth; the part in the annulate spore-case where it bursts open.
subulate: awl-shaped.
superficial: applied to organs such as the sori, when seated on the surface.
supralineate: having an excurrent rib-like projection or growth on the upper surface.
suprasoriferous: bearing sori on the upper surface.

tasseled: furnished with a crispy apical tuft or tufts.
terminal: at the end; applied when the receptacle is situated at the tip of a vein.
ternate: three-branched.
thecæ: same as *spore-cases*.
tortuous: twisted, or irregularly devious in direction.
trapeziform: four-sided, the opposite sides not parallel.
trapezioid: resembling a trapezium.
trifid: three-cleft; split at the end into three divisions.
tripinnate: thrice pinnate.
tripinnatifid: thrice pinnatifid.
truncate: terminating abruptly so as to be almost square-ended.

umbilicate: having a central navel-like depression; same as *peltate*.
unilateral: one-sided.
uniserial: in one row or series.
unisoriferous: bearing one sorus.
universal: occupying the whole surface; applied to the sori when occupying the whole area of the frond.

veins: the ribs which traverse the leafy parts of the frond; applied especially to the first series of branches or those which directly arise from the costa.
veinlets: the third series of branch veins, those which branch out from the venules.
venation: the system of veins which traverses the frond.
venose: veiny, or traversed by veins or ribs.
venules: the second series of branch veins, these which branch out from the primary veins.
vernation: the manner in which the young parts of the frond are folded up.
verrucate: warty.
verruculate: somewhat warty.
viviparous: bearing young plants.

warty: having irregular protuberances from the surface.
winged: having a narrow thin or leafy border.

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The grave or open accent (`) indicates that the vowel is to be sounded as though standing alone.
The acute or short accent (') indicates that the vowel is to be sounded in connection with the following consonant.

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Raiàna, Newm. . . . ii. 279
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vestìta, Spreng. . . . ii. 279
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THE END.

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A. *Athyrium Filix fœmina*. B. *var. plumosum*.

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ASPLENIUM FILIX-FŒMINA. VARS:
A. MARINUM. B. CONFLUENS. C. STENODON.

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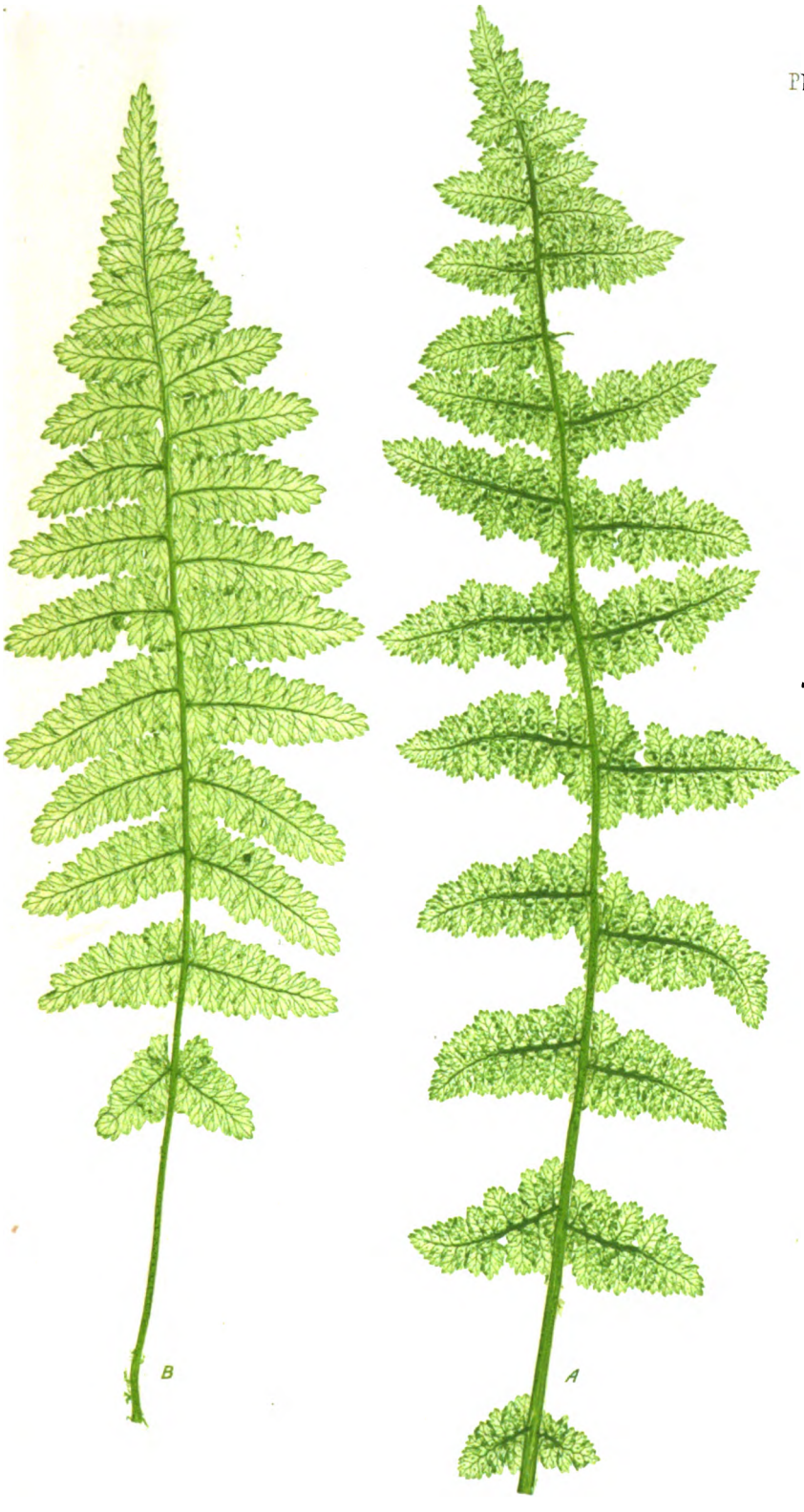

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ATHYRIUM FILIX FŒMINA, VARS.
A. CONFLUENS, B. ALPINUM.

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Athyrium Filix-fœmina, vars:
A. latifolium. B. odontomines.

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Athyrium Filix-fœmina, vars:
A. aculminatum B. excurrens.

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ATHYRIUM FILIX FŒMINA, VAR. INCISUM (Forms of)

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ATHYRIUM FILIX-FŒMINA VAR. PLUMOSUM.

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Athyrium Filix foemina, vars.
A. rhoeticum B. laxum.

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ATHYRIUM FILIX-FŒMINA L. VAR. GRACILE.

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ATHYRIUM FILIX-FOEMINA, VARS:
A. LACINIATUM, B. LACINIATUM MAJUS.

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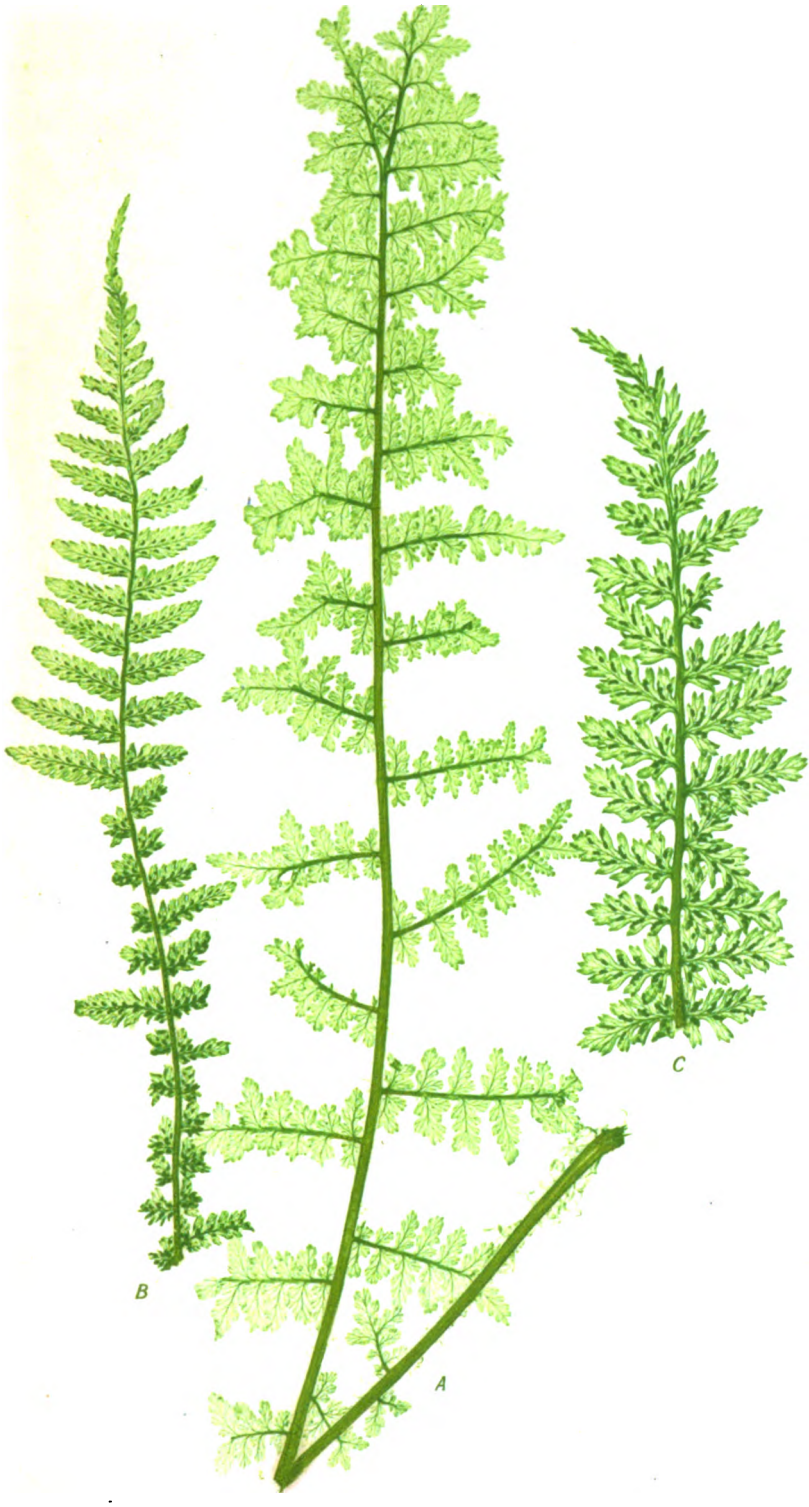

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ATHYRIUM FILIX-FŒMINA. VARS:
A. INTERRUPTUM. B. IRREGULARE. C. DISSECTUM.

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ATHYRIUM FILIX FŒMINA.
VAR: DISSECTUM.

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ATHYRIUM FILIX-FŒMINA, VAR. MULTIFIDUM.

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ATHYRIUM FILIX-FOEMINA,
VAR: DISSECTUM.

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ATHYRIUM FILIX-FOEMINA.
VAR: DISSECTUM.

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ATHYRIUM FILIX-FŒMINA. VAR. MULTIFIDUM.

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Athyrium Filix-fœmina, var. thyssanotum.

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ATHYRIUM FILIX-FŒMINA VAR. CORYMBIFERUM.

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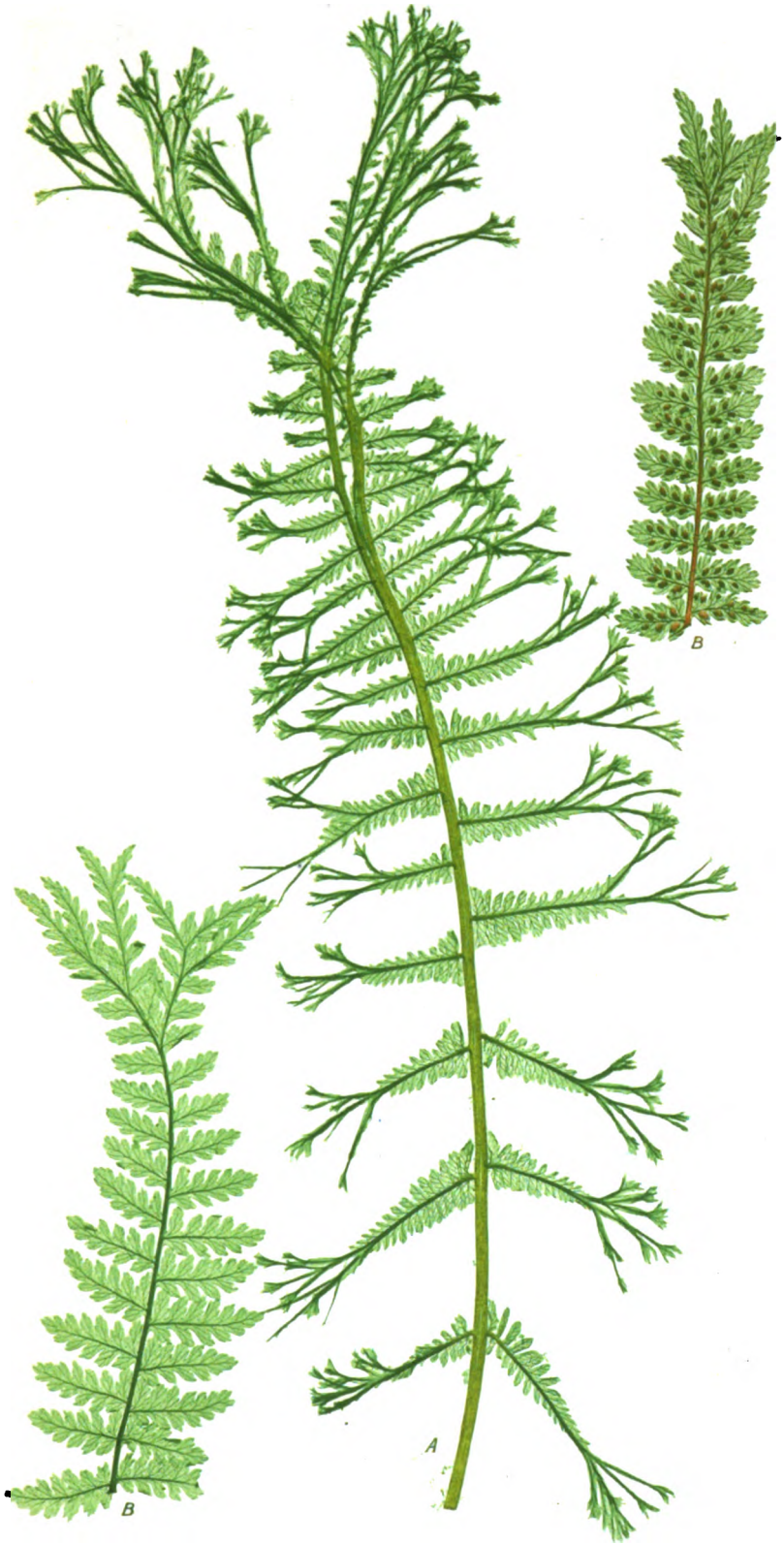

ATHYRIUM FILIX-FOEMINA, VARS:
A. DEPAUPERATUM, **B.** POLYDACTYLUM.

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ATHYRIUM FILIX-FŒMINA VAR. ACROCLADON.

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ASPLENIUM LANCEOLATUM.

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ASPLENIUM LANCEOLATUM, VAR. MICRODON.

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ASPLENIUM ADIANTUM-NIGRUM.

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ASPLENIUM FILIX-NIGRUM. VARS.
A. OBTUSATUM. B. OBLONGUM. C. OXYPHYLLUM.
D. FISSUM. E. ACUTIDENTATUM.

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Asplenium Adiantum-nigrum, var. acutum.

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ASPLENIUM MARINUM.

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ASPLENIUM MARINUM, VARS:
A. CRENATUM, B. RAMOSUM.

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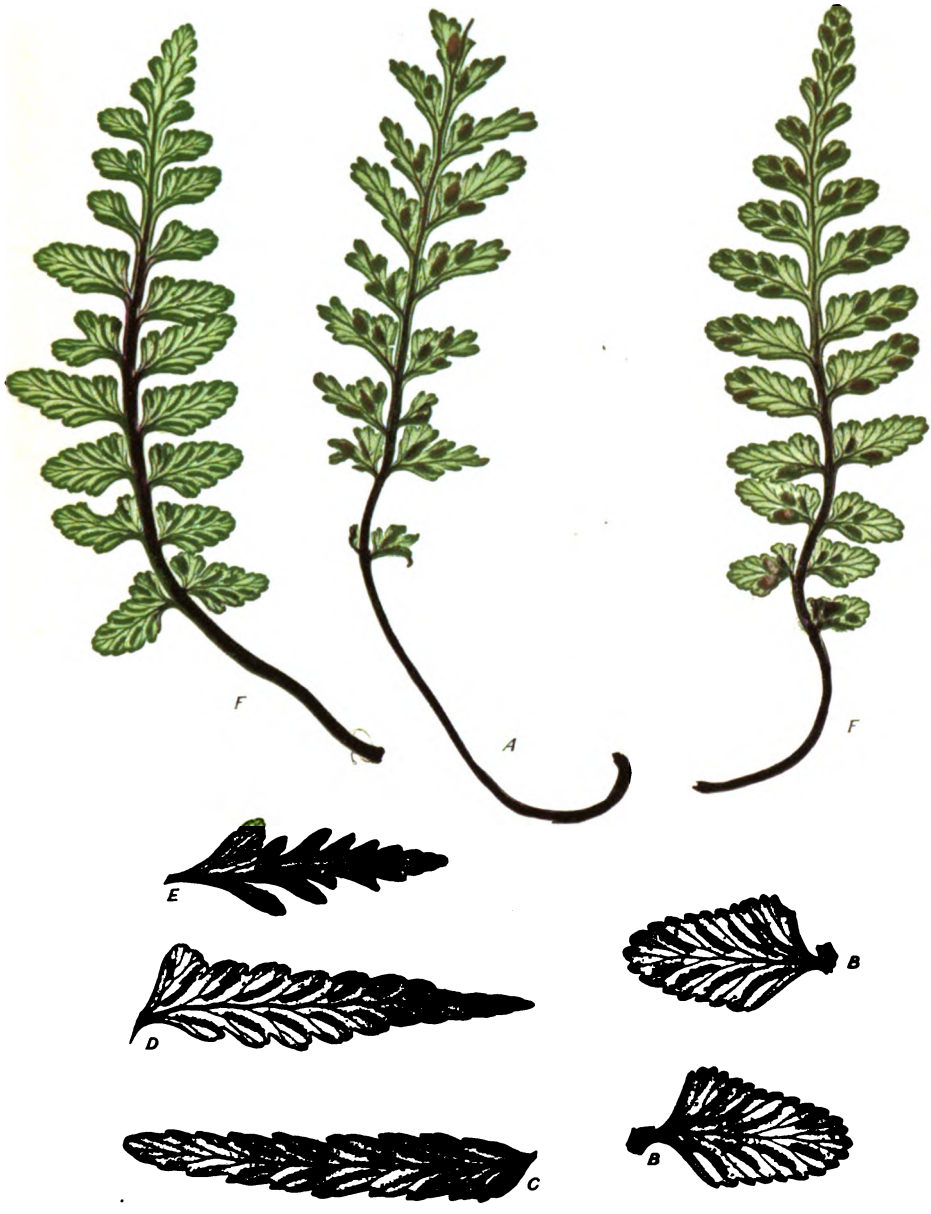

ASPLENIUM MARINUM. VARS. A INCISUM B. CRENATUM.
C. PARALLELUM D. ACUTUM E. SUBBIPINNATUM.
F. PULCHRUM.

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ASPLENIUM TRICHOMANES.

Nature Printed by Henry Bradbury.

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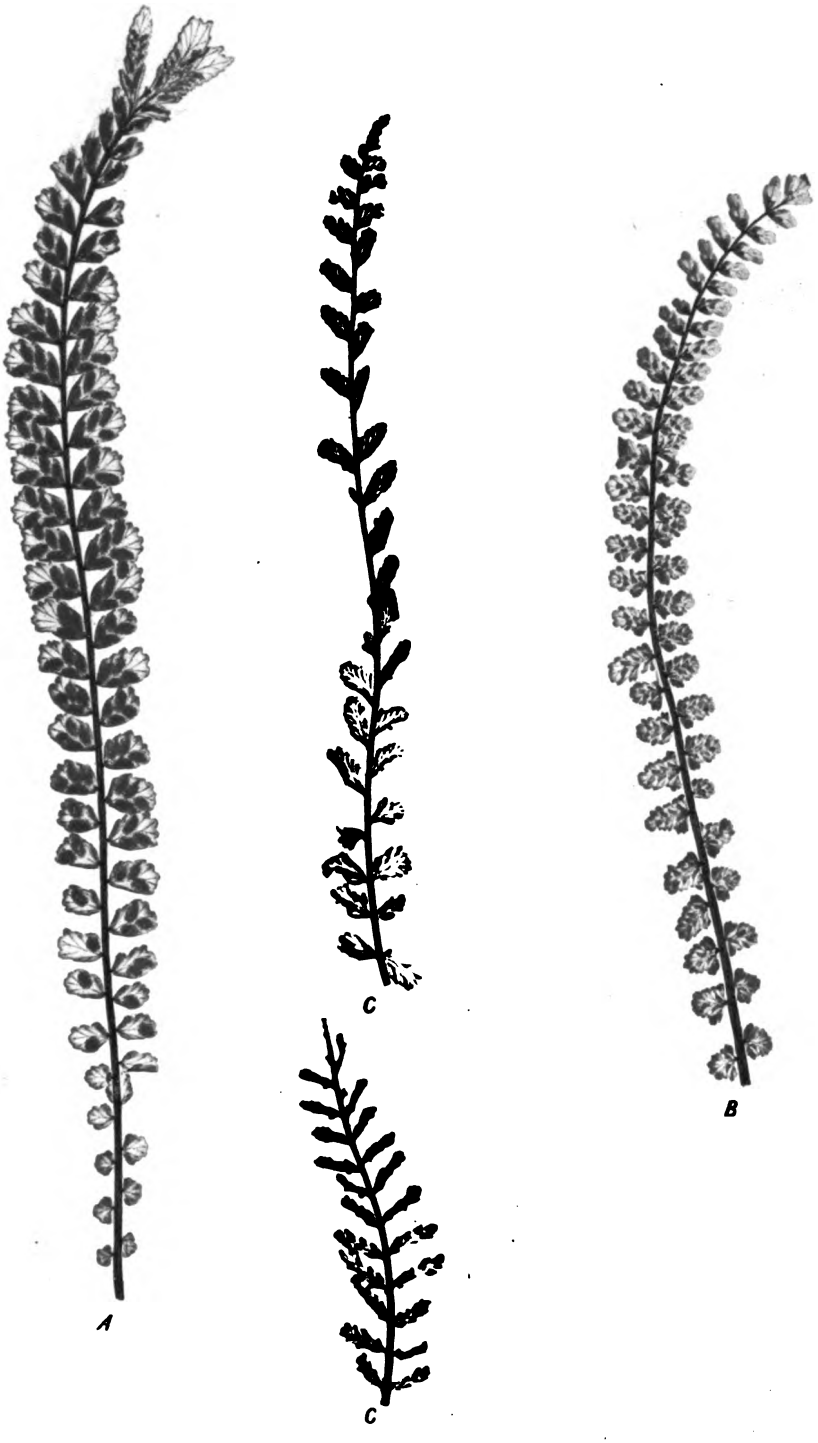

ASPLENIUM TRICHOMANES. VARS: A. BIFURCUM.
B. SUBAEQUILE. C. DEPAUPERATUM.

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ASPLENIUM TRICHOMANES. VARS:

A. *INCISUM.* ***B.*** *MULTIFIDUM.* ***C.*** *RAMOSUM.*

D. *CRISTATUM.*

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ASPLENIUM VIRIDE.

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ASPLENIUM RUTA-MURARIA.

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Plate LXXIX.

ASPLENIUM RUTA-MURARIA. VARS:

A. CUNEATUM. B. CRISTATUM. C. UNILATERALE.

D. ELATUM

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ASPLENIUM SEPTENTRIONALE.

ature Printed by Henry Bradbury

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Scolopendrium vulgare.

...ere printed by Henry Bridbury.

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SCOLOPENDRIUM VULGARE, VARS:

A. POLYSCHIDES, B. CRISPUM, C. IRREGULARE.

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SCOLOPENDRIUM VULGARE. VARS:
A. OBTUSIDENTATUM. B. CORNUTUM.

Printed by Henry Bradbury

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SCOLOPENDRIUM VULGARE, VARS.

A. ABRUPTUM. B. CRENATO-LOBATUM.

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SCOLOPENDRIUM VULGARE. VARS.
A. MARGINATUM. B. SUBVARIEGATUM.

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SCOLOPENDRIUM VULGARE. VARS.
A. SUPRILINEATUM B. MULTIFORME.

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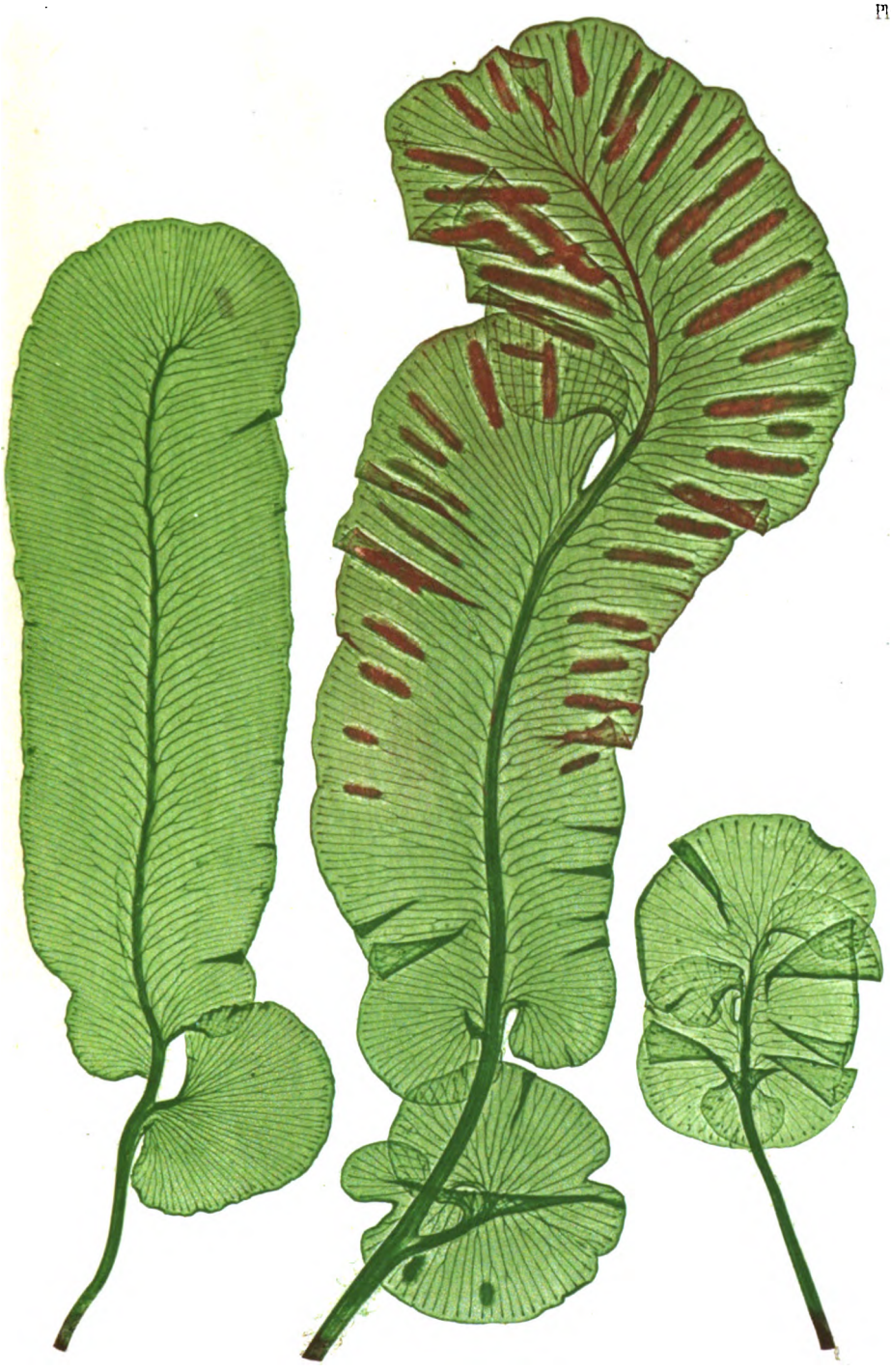

Scolopendrium vulgare. var. variabile.

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SCOLOPENDRIUM VULGARE, VAR. MULTIFIDUM.

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Scolopendrium vulgare var. didymum.

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SCOLOPENDRIUM VULGARE. VARS:

***A.** RAMO PROLIFERUM (forma of) **B.** VIVIPARUM.*

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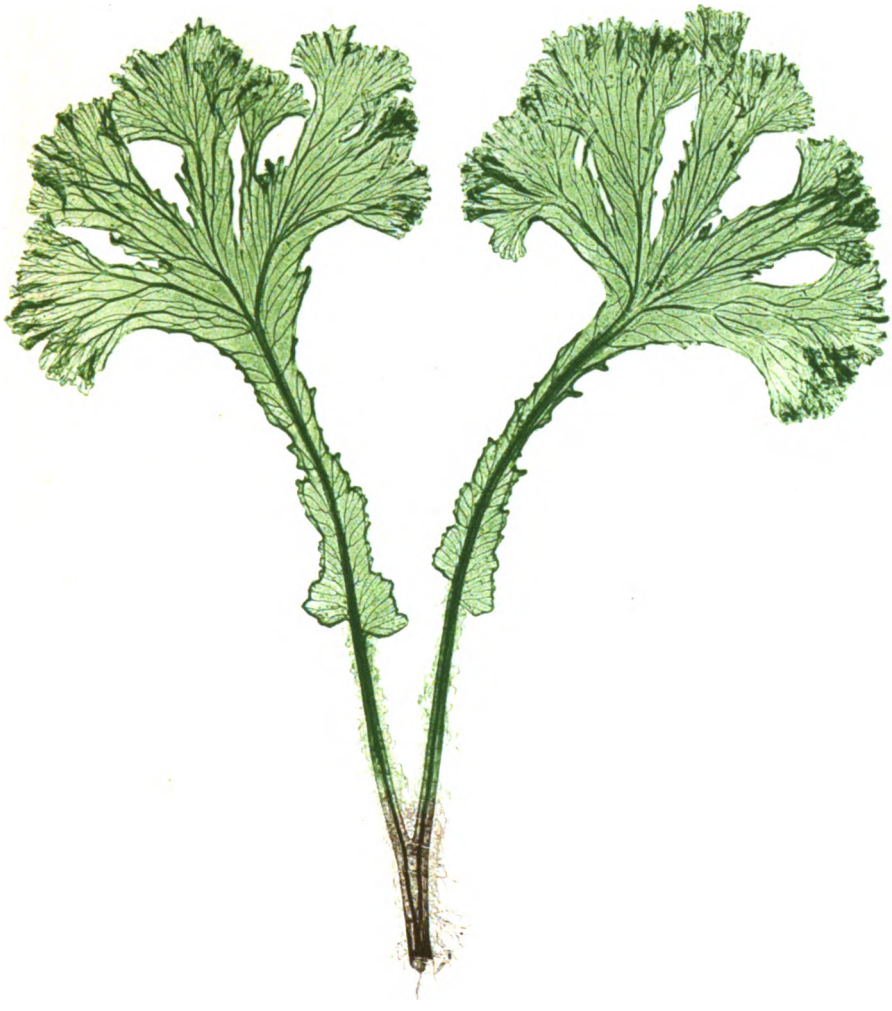

SCOLOPENDRIUM VULGARE. VAR: RAMO MARGINATUM.

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SCOLOPENDRIUM VULGARE, VARS:
A. DISTORTUM. B. FORTUM. C. CONTRACTUM.

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Scolopendrium vulgare var. laceratum.

Nature Printed by Henry Bradbury

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SCOLOPENDRIUM VULGARE. VAR.
MARGINATO-LACERATUM.

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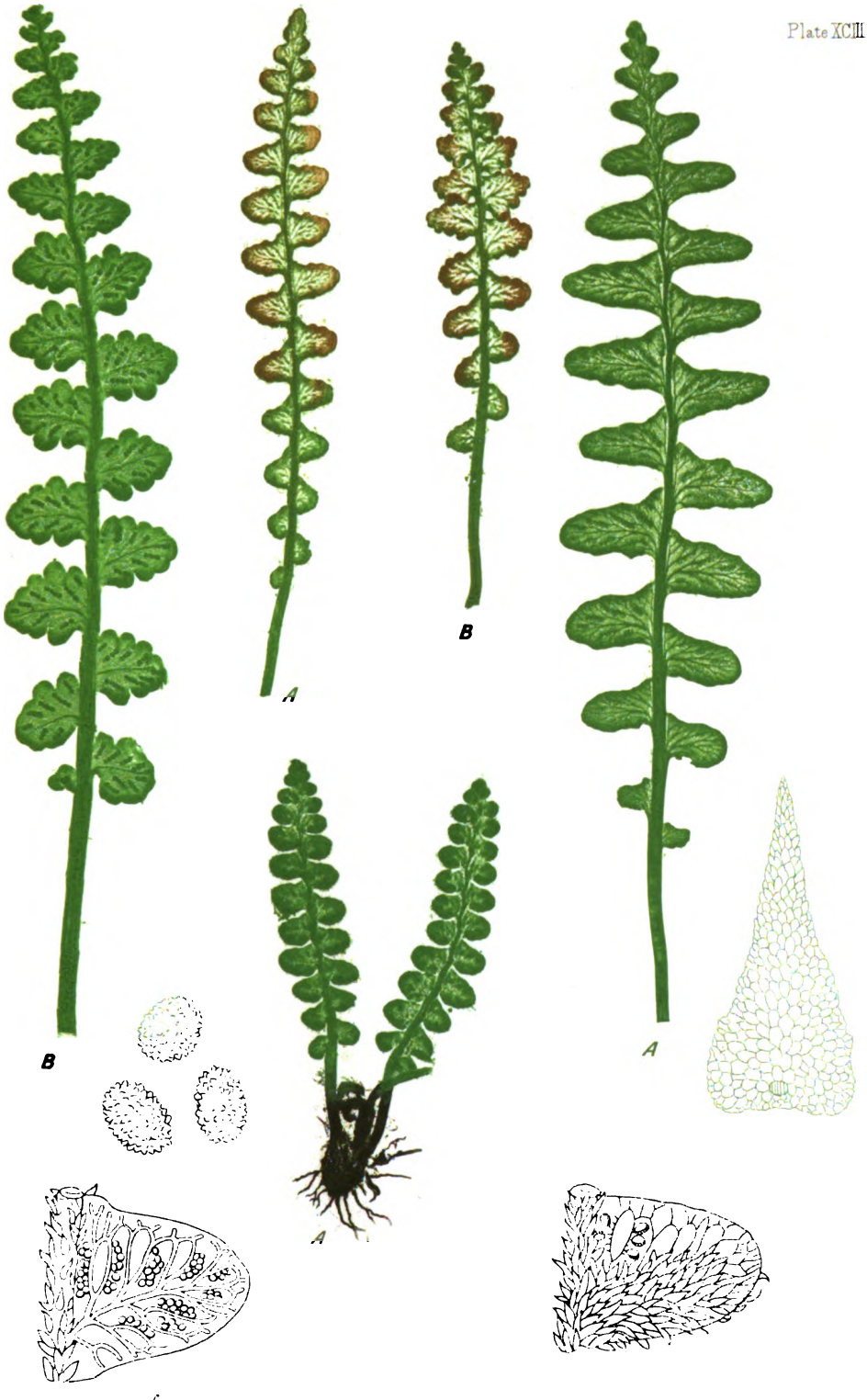

A. Ceterach officinarum. B. var crenatum.

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Scolopendrium vulgare var. laceratum.

Nature Printed by Henry Bradbury

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SCOLOPENDRIUM VULGARE. VAR.
MARGINATO-LACERATUM.

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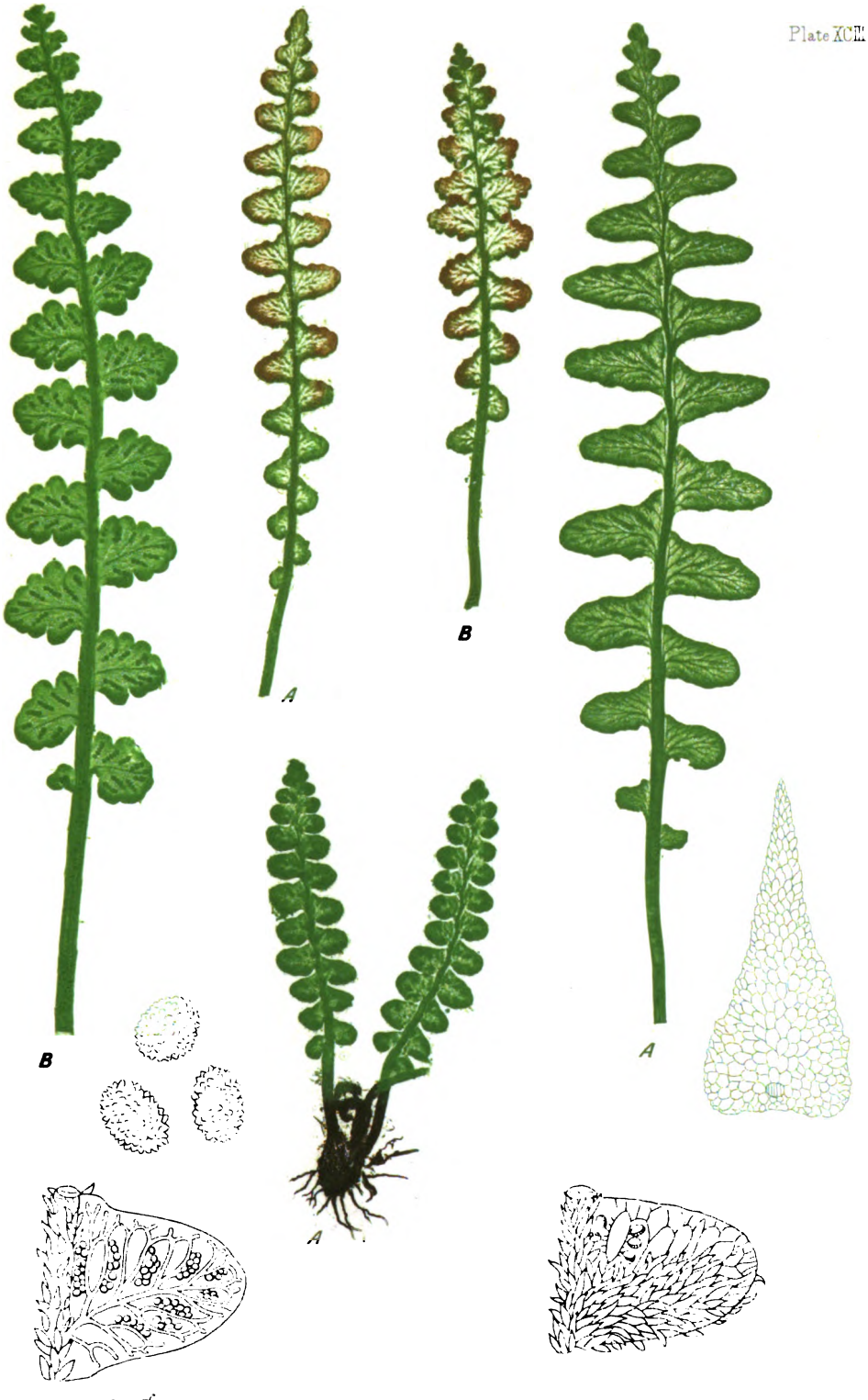

A. Ceterach officinarum. B. Var crenatum.

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BLECHNUM SPICANT.

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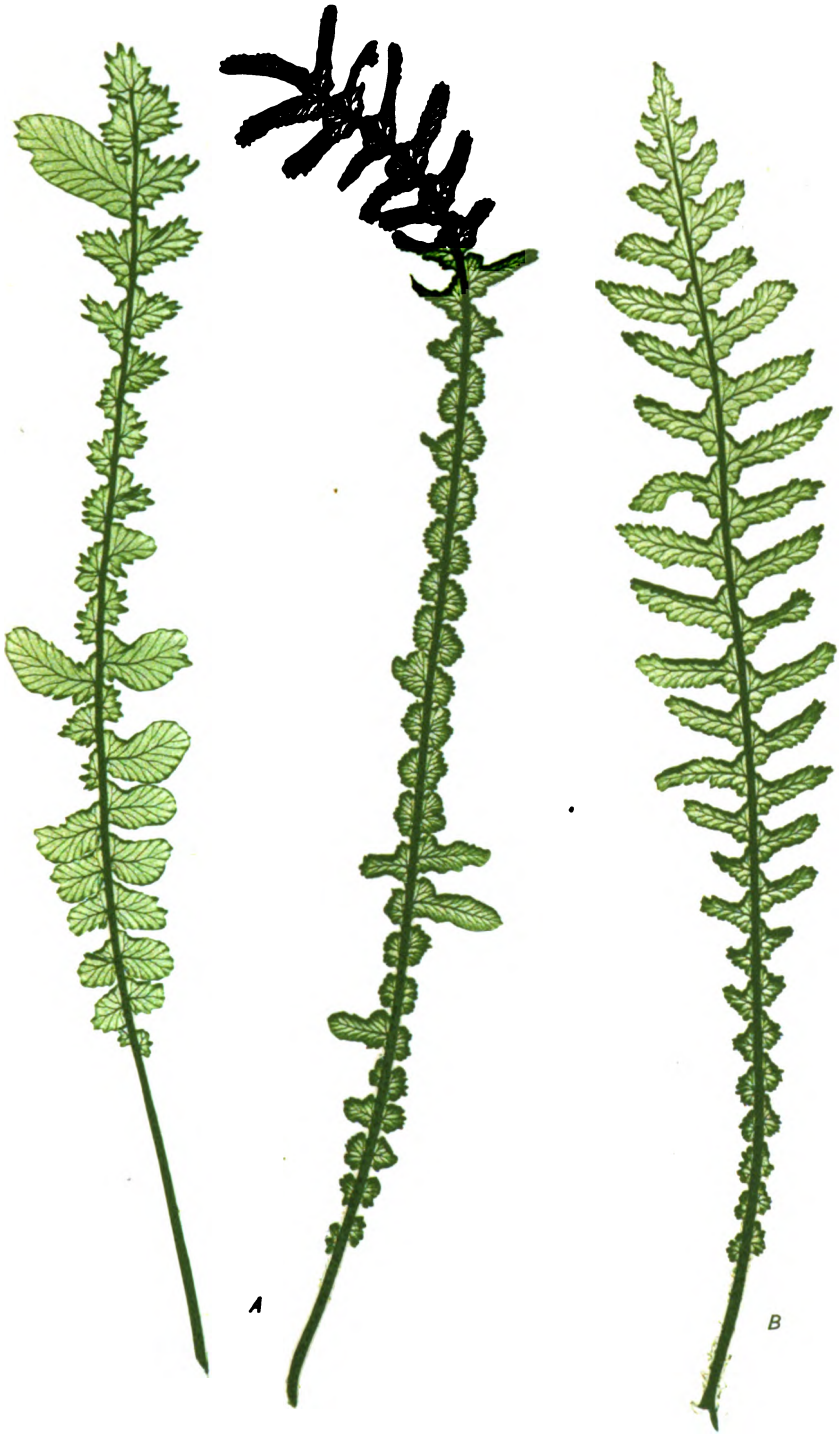

BLECHNUM SPICANT, VARS:
A. HETEROPHYLLUM. B. STRICTUM.

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BLECHNUM SPICANT. VARS:
A. RAMOSUM B. TRINERVIUM.

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BLECHNUM SPICANT. VARS:
A. MULTIFIDUM. B. MULTIFURCATUM.

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PTERIS AQUILINA.

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Pteris aquilina var. multifida.

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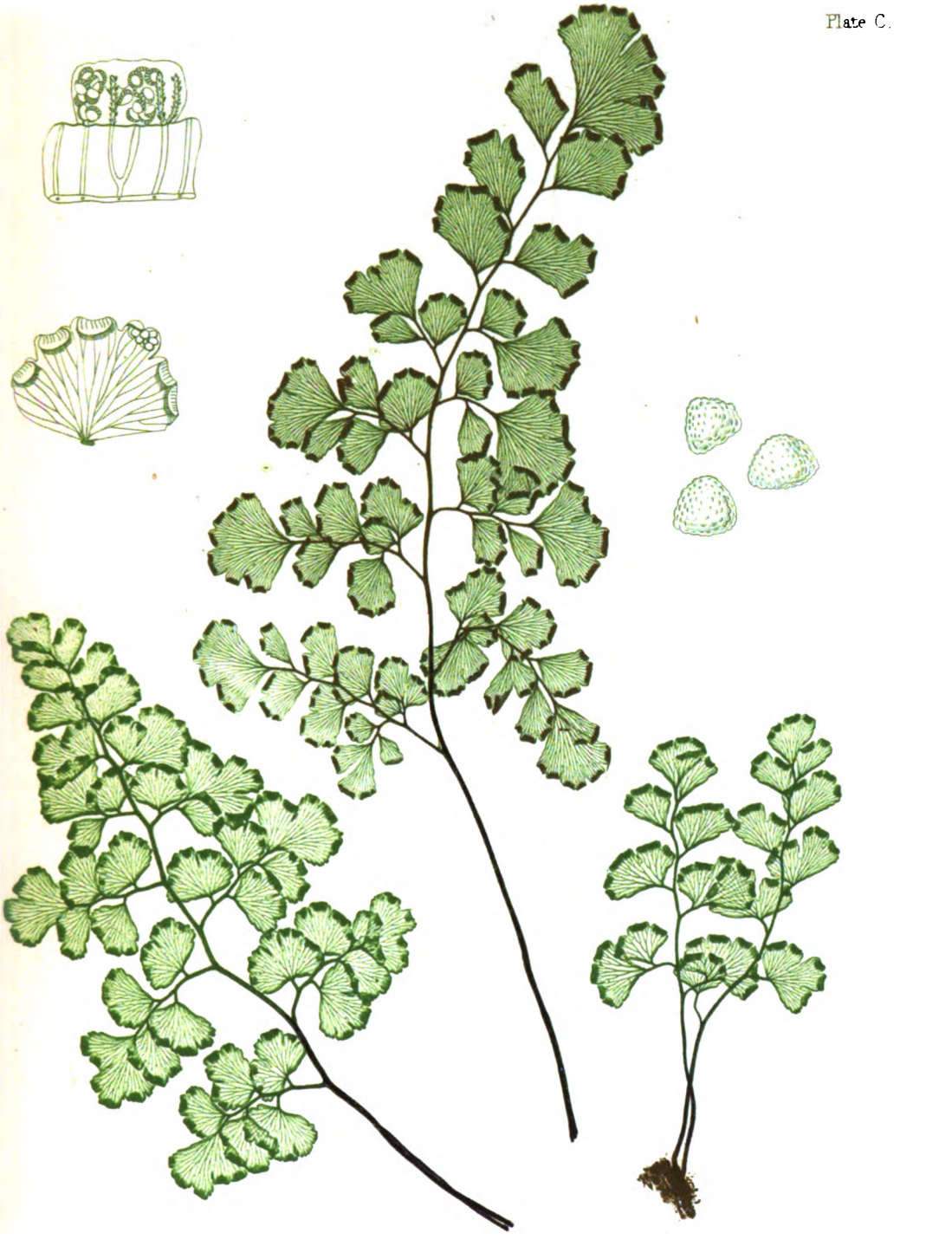

ADIANTUM CAPILLUS-VENERIS.

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CYSTOPTERIS FRAGILIS.

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CYSTOPTERIS FRAGILIS, VARS.

A. DENTATA. B. DICKIEANA. C. ANGUSTATA.
D. DECURRENS. E. INTERRUPTA.

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CYSTOPTERIS REGIA.

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CYSTOPTERIS MONTANA.

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Woodsia ilvensis.

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WOODSIA ALPINA.

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A. Trichomanes radicans. B. var. Andrewsii.

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HYMENOPHYLLUM TUNBRIDGENSE.

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HYMENOPHYLLUM UNILATERALE.

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OSMUNDA REGALIS.

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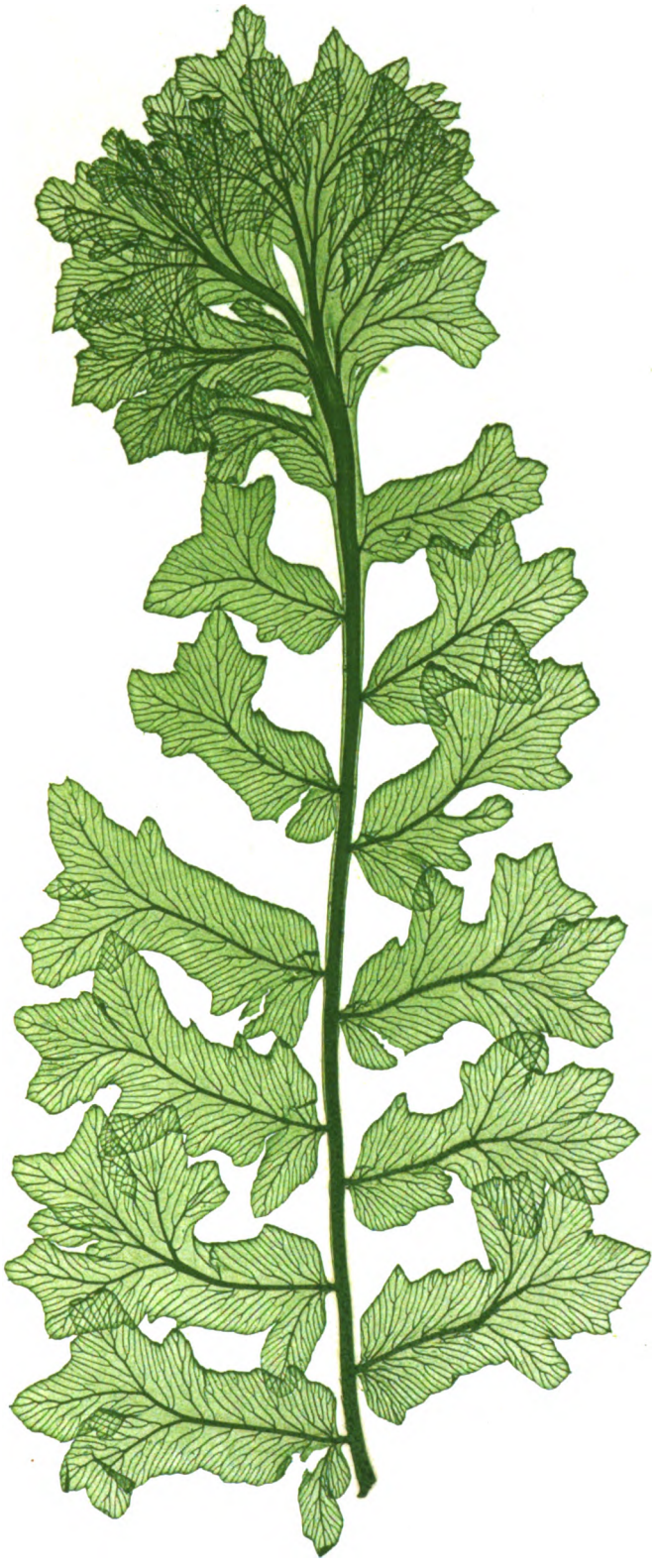

OSMUNDA REGALIS VAR: CRISTATA.

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Botrychium Lunaria.

Nature Painted by Henry Bradbury

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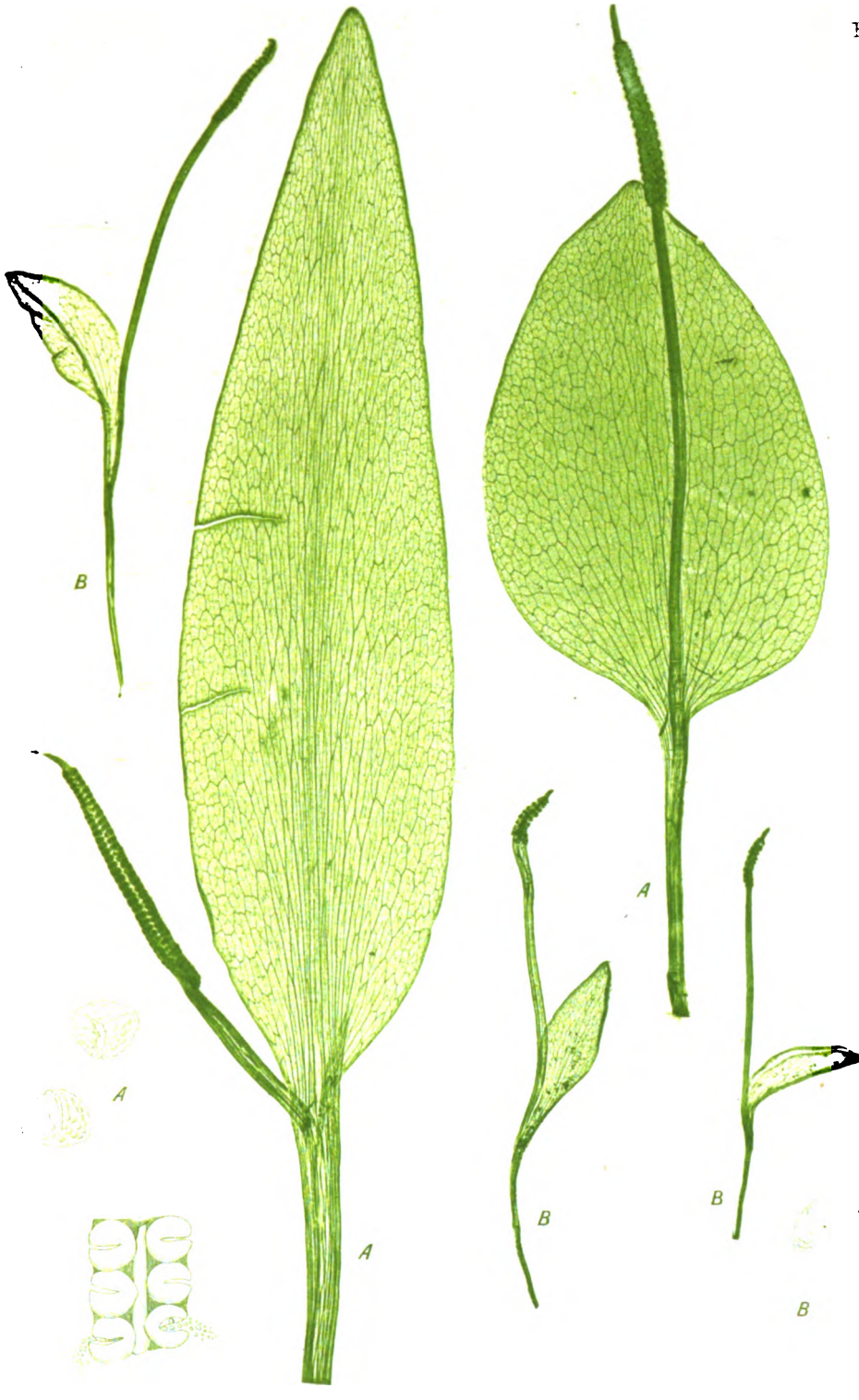

A. OPHIOGLOSSUM VULGATUM. B. VAR MINUS.

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Ophioglossum lusitanicum.

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